CARLSON
ENVIRONMENTAL, INC.

SITE HEALTH AND SAFETY PLAN

Fansteel, Inc.
Number One Tantalum Place
North Chicago, Illinois

Prepared by
CARLSON ENVIRONMENTAL, INC.
312 West Randolph Street
Suite 300
Chicago, Illinois 60606
(312) 346-2140

Project No. 9566C

Revised Version 2.0
October 1998

From: JOHNJ OGRADY
To: BAUMANN-ALAN
Date: 10/22/98 9:56am
Subject: FANSTEEL SITE HEALTH AND SAFETY PLAN

Alan,

I am sending to you or will drop off a copy of the October 1998 revised Site HASP for the Fansteel EE/CA.

I would appreciate your review of this document in light of your previous comments and the corrections made.

If you have any questions, please contact me at your earliest convenience.

Thanks!

JohnJ O'Grady
6-1477

CC: OSTRODKA-STEPHEN

CARLSON
ENVIRONMENTAL, INC.

October 20, 1998 PN 9566C

Mr. John J. O'Grady
Remedial Project Manager
U.S. EPA Region 5
Superfund Division
77 West Jackson
Chicago, Illinois 60604

RE: Responses to July 20, 1998 Comments for the HASP
Fansteel - North Chicago, Illinois

Dear Mr. O'Grady:

On behalf of Fansteel, Inc., Carlson Environmental, Inc. (CEI) has revised the enclosed Site Health and Safety Plan (HASP) to incorporate comments 75 through 92 of your July 20, 1998 letter. This HASP is being submitted for EPA review and approval.

At this time, CEI's Quality Assurance Project Plan (QAPP) and Great Lakes Analytical's QAPP are being revised to incorporate your comments. These Plans will be forwarded to you upon completion.

Please feel free to contact me at (312) 704-8843 if you have any question or require additional information during your review of the enclosed items.

Respectfully submitted,

CARLSON ENVIRONMENTAL, INC.

Margaret Karolyi

Margaret M. Karolyi, P.E.
Project Manager

cc: Cliff Lake, McBride Baker & Coles
Jon Jackson, Fansteel, Inc.

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TABLE OF CONTENTS

1.0 INTRODUCTION 1-1
1.1 Scope and Applicability of the Site Health and Safety Plan 1-1
1.2 Visitors 1-2

2.0 KEY PERSONNEL/IDENTIFICATION OF HEALTH AND SAFETY 2-1
2.1 Key Personnel 2-1
2.2 Site Specific Health and Safety Personnel 2-2
2.3 Organizational Responsibility 2-2

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS 3-1
3.1 Historical Overview of Site 3-1
3.2 Task by Task Risk Analysis 3-1
3.3 Task Hazard Descriptions for Off-site Activities 3-3
3.4 Physical Hazards 3-3

4.0 PERSONNEL TRAINING REQUIREMENTS 4-1
4.1 Preassignment and Annual Refresher Training 4-1
4.2 Site Supervisors Training 4-1
4.3 Training and Briefing Topics 4-1

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED 5-1
5.1 Levels of Protection 5-1
5.2 Level A Personnel Protective Equipment 5-2
5.3 Level B Personnel Protective Equipment 5-3
5.4 Level C Personnel Protective Equipment 5-3
5.5 Level D Personnel Protective Equipment 5-4
5.6 Reassessment of Protection Program 5-4
5.7 Work Mission Duration 5-5
5.8 Chemical Resistance and Integrity of Protective Material 5-5
5.9 SOP for Respiratory Protection Devices 5-6
5.10 SOP for Personal Protective Equipment 5-6
5.11 Specific Levels of Protection Planned for the Site 5-8

6.0 MEDICAL SURVEILLANCE REQUIREMENTS 6-1
6.1 Baseline or Preassignment Monitoring 6-1
6.2 Periodic Monitoring 6-1
6.3 Site Specific Medical Monitoring 6-2

TABLE OF CONTENTS (Continued)

6.4 Exposure/Injury/Medical Support 6-2
6.5 Exit Physical 6-2

7.0 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING 7-1
7.1 Direct-Reading Monitoring Instruments 7-1

8.0 SITE CONTROL MEASURES 8-1
8.1 Buddy System 8-1
8.2 Site Communications Plan 8-1
8.3 Work Zone Definition 8-1
8.4 Nearest Medical Assistance 8-2
8.5 Safe Work Practices 8-2
8.6 Soil Borings and Sampling Activities 8-2
8.7 Heat Stress 8-3
8.7.1 Signs and Symptoms 8-3
8.8 Cold Stress 8-4
8.9 Dust and Spill Control 8-6
8.10 Hearing Conservation 8-6
8.11 Fall Protection 8-7
8.12 Emergency Alarm Procedures 8-7

9.0 DECONTAMINATION PLAN 9-1
9.1 Standard Operating Procedures 9-1
9.2 Levels of Decontamination Protection Required for Personnel 9-1
9.3 Equipment Decontamination 9-1
9.4 Disposition of Decontamination Wastes 9-1

10.0 EMERGENCY RESPONSE/CONTINGENCY PLAN 10-1
10.1 Pre-Emergency Planning 10-1
10.2 Personnel Roles and Lines of Authority 10-1
10.3 Emergency Recognition/Prevention 10-1
10.4 Evacuation Routes/Procedures 10-2
10.5 Emergency Contact/Notification System 10-4
10.6 Emergency Medical Treatment Procedures 10-6
10.7 Fire or Explosion 10-6
10.8 Spill or Leaks 10-6
10.9 Emergency Equipment/Facilities 10-6

TABLE OF CONTENTS (Continued)

11.0 CONFINED SPACE ENTRY PROCEDURES 11-1
11.1 Definitions 11-1
11.2 General Provisions 11-2
11.3 Procedure for Confined Space Entry 11-4
11.4 Confined Space Observer 11-5

12.0 SPILL CONTAINMENT PROGRAM 12-1

13.0 HAZARD COMMUNICATION 13-1
13.1 Container Labeling 13-1
13.2 Material Safety Data Sheets (MSD Sheets) 13-1
13.3 Employee Training and Information 13-2

CARLSON ENVIRONMENTAL, INC.

TABLE OF CONTENTS (Continued)

LIST OF TABLES

Table 3.1 - Task Analysis Chemical Hazards of Concern 3-3
Table 3.2 - Potential Physical Hazards of Concern 3-4
Table 5.1 - Sample PPE Inspection Checklists 5-7
Table 5.2 - Specific Levels of Protection Planned for the Task Assignments at the Site . 5-9
Table 7.1 - Some Direct-Reading Instruments for General Survey 7-3
Table 8.1 - Personnel Requirements 8-8
Table 8.2 - Standing Orders for Exclusion Zone 8-8
Table 8.3 - Standing Orders for Contamination Reduction Zone 8-8
Table 10.1 - Emergency Recognition / Control Measures 10-5

LIST OF FIGURES

Figure 8.1a - Driving Directions from Site to Victory Memorial Hospital 8-9
Figure 8.1b - Driving Directions from Site to Great Lakes Naval Hospital 8-10
Figure 8.2 - Sample Site Work Zones 8-11
Figure 9.1 - Level A Decontamination Steps 9-2
Figure 9.2 - Level B Decontamination Steps 9-3
Figure 9.3 - Level C Decontamination Steps 9-4
Figure 9.4 - Level D Decontamination Steps 9-5
Figure 10.1 - Egress Routes 10-3

ATTACHMENT

Attachment A - Forms
Attachment B - Material Data Safety Sheets
Attachment C - Respiratory Protection Plan

1.0 INTRODUCTION

This Site Health and Safety Plan (HASP) was prepared by Carlson Environmental, Inc. (CEI) for the Fansteel, Inc. property located at Number One Tantalum Place in North Chicago, Illinois (hereafter referred to as "Site"). The HASP was prepared by CEI on behalf of Fansteel, Inc., in conjunction with a Site Investigation Work Plan. The HASP is intended to provide guidance on the health and safety measures and precautions that should be exercised while completing the field activities outlined in the Site Investigation Work Plan.

This Section of the HASP document defines general applicability and general responsibilities with respect to compliance with Health and Safety programs.

1.1 Scope and Applicability of the Site Health and Safety Plan - The purpose of this HASP is to define the requirements and designate protocols to be followed at the Site during investigation and remediation activities. Applicability extends to CEI personnel and its contractors and subcontractors. Any Government employees, contractors, subcontractors, or visitors shall also comply with this HASP.

All personnel on site, contractors and subcontractors included, shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This HASP summarizes those hazards in Table 3.1 and defines protective measures planned for the site.

This HASP must be reviewed and an agreement to comply with the requirements must be signed by all personnel prior to entering the exclusion zone or contamination reduction zone. The agreement form is included in Attachment A.

During development of this HASP, consideration was given to current safety standards as defined by EPA/OSHA/NIOSH, health effects and standards for known contaminants, and procedures

designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources have been consulted:

- OSHA 29 CFR 1910.120, 1910.134 and EPA 40 CFR 311
- U.S. EPA, OERR ERT Standard Operating Safety Guides
- NIOSH/OSHA/USCG/EPA Occ. Health and Safety Guidelines
- (ACGIH) Threshold Limit Values
- 35 Illinois Administrative Code 742, Tiered Approach to Corrective Action Objectives
- EPA Health and Safety Plan Version 3.0c

1.2 Visitors - All visitors entering the contamination reduction zone and exclusion zone at the Site will be required to read and verify compliance with the provisions of this HASP. In addition, visitors will be expected to comply with relevant OSHA requirements such as medical monitoring (Sec. 6.0), training (Sec. 4.0), and respiratory protection (if applicable). Visitors will also be expected to provide their own protective equipment.

In the event that a visitor does not adhere to the provisions of the HASP, he/she will be requested to leave the work area. All nonconforming incidents will be recorded in the site log.

Section 2.0

2.0 KEY PERSONNEL/IDENTIFICATION OF HEALTH AND SAFETY

2.1 Key Personnel - The following personnel and organizations are critical to the planned activities at the Site. The organizational structure will be reviewed and updated periodically by the Site Supervisor.

Carlson Environmental

Project Director:	Edward Garske (312/704-8850)
Project Manager:	Margaret Karolyi (312/704-8843)
Project Engineer:	Kenneth James (312/704-8850)
Site Health and Safety Officer:	Lisa Meagher (312/704-2216) - designated Margaret Karolyi (312/704-8843) - alternate Bruce Shabino (312/704-8853) - alternate
Other Technical Assistants:	Samuel Bodine (312/704-8861) Kristin O'Brien (312/704-2494) Jeffrey Voelker (312/704-2214)

Subcontractors to Carlson Environmental

Geoprobe Contractor:	to be determined
Analytical Laboratory:	Great Lakes Analytical in Buffalo Grove, Illinois Kevin Keeley, Laboratory Director (847/808-7766)

IEPA, EPA and Related Contractors

The planned site activities will be performed on behalf of Fansteel, Inc. by CEI and their subcontractors. If representatives of the Illinois Environmental Protection Agency (IEPA), United States Environmental Protection Agency (EPA) or their contractors are to perform work at the Site, it is anticipated that such activities will be conducted in accordance with this HASP and that all personnel will have the appropriate training requirements, as specified in Section 4.0. Section 2.3 below outlines the typical project management structure in the event of EPA participation.

2.2 Site Specific Health and Safety Personnel - The Site Health and Safety Officer (HSO) has total responsibility for ensuring that the provisions of this HASP are adequate and implemented in the field. Changing field conditions may require decisions to be made concerning adequate protection programs. Therefore, it is vital that personnel assigned as HSO be experienced and meet the additional training requirements specified by OSHA in 29 CFR 1910.120 (see Section 4.0 of this HASP). The HSO is also responsible for conducting site inspections on a regular basis in order to ensure the effectiveness of this HASP. The HSO at the Site is Lisa Meagher. Designated alternates are Margaret Karolyi and Bruce Shabino.

2.3 Organizational Responsibility -

CEI Project Director: Has final responsibility and authority for all work performed.

CEI Project Manager: Has responsibility for maintaining technical continuity and achieving the project goals. The Project Manager will coordinate activities and facilitate communication between the other project personnel (including contractors/subcontractors)and Fansteel, Inc. representatives.

CEI Project Engineer: Has the responsibility for maintaining the quality of all engineering activities associated with the project.

CEI Health and Safety Officer: Ensures that the field activities are implemented in accordance with this HASP. The HSO will amend and revise the HASP as necessary to respond to changes in field conditions and scopes of work.

CEI Site Supervisor: The Project Manager or HSO will function as the Site Supervisor during the field work activities. The Site Supervisor has the responsibility of executing the field activities in accordance with the Work Plan, Health and Safety Plan and Quality Assurance Project Plan. The Site Supervisor will direct CEI's subcontractors as necessary to complete the field activities.

Note: The sections below apply only if the IEPA or EPA conduct activities at the Site that are not covered by Fansteel, Inc.'s *Site Investigation Work Plan*.

EPA Participation: Either in the capacity as On-Scene Coordinator (OSC), Remedial Project Manager (RPM), or Site Inspection Officer (SIO), the EPA representative is responsible for overall project administration and contractor oversight. As a part of that oversight function, EPA will ensure that project plans meet OSHA requirements at a minimum, and that the Health and Safety of all site personnel is a primary concern. As an OSC or RPM, EPA serves in the capacity of Site Supervisor.

Technical Assistance Team (TAT): The Technical Assistance Team (TAT) is responsible for providing the OSC with assistance and support in regards to all technical, regulatory, and safety aspects of site activity. The TAT is also available to advise the OSC on matters relating to sampling, treatment, packaging, labeling, transport, and disposal of hazardous materials.

Emergency Response Contractor System (ERCS): The various ERCS organizations have primary responsibility for supplying personnel and equipment for emergency removal operations under an OSC's oversight. The response manager for ERCS has overall responsibility for ensuring that safety aspects of the removal project are implemented and technical progress is constant.

Field Investigation Team (FIT): The FIT contractors are responsible for data collection activities in response to planned removals under an RPM's oversight. The FIT program is primarily involved in remedial investigations (RI) and feasibility studies (FS).

Remedial Contacts (REM): The various REM contracts and contractors are responsible solely for data collections for RI activities. REM programs are also responsible for feasibility studies, which culminate in RI/FS reports in support of EPA's remedial programs.

Section 3.0

3.0 TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS

3.1 Historical Overview of Site - This HASP defines the hazards and methods to protect personnel from those hazards as identified in previous site work or background information. For a thorough overview of historical information concerning the Site, see the following documents:

- *Site Investigation Work Plan*, October 1998, prepared by Carlson Environmental, Inc.
- *Engineering Evaluation/Cost Analysis for the Vacant Lot Site*, October 30, 1997, prepared by Ecology and Environment, Inc. for EPA.

3.2 Task by Task Risk Analysis - The evaluation of hazards is based upon the knowledge of the site background presented in Section 3.1, and anticipated risks posed by the specific operation. The following subsections describe each task/operation in terms of the specific hazards associated with it. In addition, the protective measures to be implemented during completion of those operations are also identified. Table 3.1 provides a summary of task analysis for potential chemical hazards associated with each task at the Site, based on the results of previous site investigations. Table 3.2 identifies additional potential physical hazards associated with the planned sampling activities.

3.3 Task Hazard Descriptions for Off-Site Activities - The Fansteel North Chicago facility and Vacant Lot Site boundaries generally separate the "clean" off-site areas, from the "contaminated" on-site areas, and so chemical contamination from the Site should not be a hazard associated with perimeter and off-site monitoring.

Perimeter monitoring and off-site monitoring are performed once the Site's boundaries have been established. Hazards specific to perimeter and off-site monitoring include encounters with residents and non-project personnel. This is a unique hazard, in that untrained personnel prove to be a risk when performing any type of site work. Inquisitive and/or hostile persons may interfere with the

monitoring/sampling effort, jeopardizing the safety of themselves as well as the safety of the field team.

TABLE 3.1 TASK ANALYSIS CHEMICAL HAZARDS OF CONCERN

CONTAMINANT	TLV/IDLH	POTENTIAL SOURCES	ROUTES OF EXPOSURE
Cadmium	TLV: 0.01 mg (Cd)/ m^3 IDLH: Not applicable, potential human carcinogen (NIOSH, 1994)	Ground Water (0-20 ft), Surface and Subsurface Soils, Sediments	Inhalation Ingestion
Trichloroethene	TLV: 50 ppm IDLH: Not applicable, potential human carcinogen (NIOSH, 1994)	Ground Water (0-20 ft), Surface and Subsurface Soils, Sediments	Inhalation Ingestion Contact
Lead, Inorganic	TLV: 0.15 mg/m^3 (MSDS, 1990) IDLH: 100 mg/m^3 (NIOSH, 1994)	Ground Water (0-20 ft), Surface and Subsurface Soils, Sediments	Inhalation Ingestion Contact
Polychlorinated Biphenyls	TLV: 1 mg/m^3 (MSDS, 1990)	Sediments	Ingestion Contact

TABLE 3.2 POTENTIAL PHYSICAL HAZARDS OF CONCERN

POTENTIAL HAZARD	ASSOCIATED ACTIVITY	PREVENTATIVE MEASURE
Physical injury due to accidents with heavy machinery and falling objects	Soil sampling and monitoring well installation	Avoid unnecessary contact and proximity to Geoprobe rig. Wear hard hat and steel-toe work boots (refer to Level D PPE in Section 5.5).
Slip, trip, fall potential	Soil and sediment sampling, well installation, well sampling	Exercise good housekeeping practices (put unnecessary equipment away). Concentrate and remain alert.
Excessive Noise	Geoprobe activities	Wear appropriate ear protection (ear plugs) (refer to 8.10)
Dermal contact with contaminated media	All sampling activities and decontamination activities	Wear appropriate PPE. Avoid direct contact with affected media (refer to Section 5.0).
Inhalation of contaminants	All sampling activities and decontamination activities	Conduct air monitoring and, if appropriate, upgrade to Level C breathing apparatus (refer to Sections 5.0 and 7.0).
Ingestion of contaminants	All sampling activities and decontamination activities	Avoid direct contact with affected media. No eating, drinking or smoking in the work zones (refer to Section 8.3)
Trespassers/visitors	All field activities	Readily identify and remove unauthorized personnel from the Work Zones (refer to Section 8.3).

To minimize public involvement in perimeter monitoring/off-site monitoring, the most effective preventative measure is to inform all interested parties. Notifying state and local police, the fire department, and any local/state governmental officials of the projects purpose and scope will allow those authorities to answer questions posed to them by local residents and the media by preparing statements on the projects purpose or by informing the public where to call for further information. This will alleviate the problem of work stoppage due to field personnel answering questions.

3.4 Physical Hazards -

General Description:

- LEAD, INORGANIC- Small, white to blue-gay metallic shot or granules. Odorless and insoluble in water.

- TRICHLOROETHYLENE- Trichloroethylene is a clear colorless volatile liquid having a chloroform-like odor. It is used as a solvent, fumigant, in the manufacture of other chemicals, and for many other uses. It is heavier than water and is slightly soluble in water. It is non-combustible.

- CADMIUM COMPOUND- Soft, blue-white solid. Relatively insoluble.

- PCBs - Commercial PCBs are mixtures that were once widely manufactured by combining chlorine gas, iron filings, and biphenyls. PCBs are useful as insulators in electrical equipment because they are electrically non-conductive.

Health Hazards:

- LEAD, INORGANIC- Poisonous and may be fatal if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. Neurotoxin.

- TRICHLOROETHYLENE- VAPOR: Irritating to eyes, nose and throat. If inhaled, will cause nausea, vomiting, difficult breathing, or loss of consciousness. LIQUID: Irritating to skin and eyes. If swallowed, will cause nausea, vomiting, difficult breathing, or loss of consciousness. (USCG, 1985)

- CADMIUM COMPOUND- Poisonous if swallowed. Inhalation of dust poisonous. Fire may produce irritating or poisonous gases. Runoff from fire control or dilution water may cause pollution. (DOT, 1984)

- PCBs - Considered by EPA as carcinogens and is a potential liver toxin. Effects of accidental exposure include acneform eruptions; eye discharge; swelling of the upper eyelids and hyperemia of the conjuctiva; hyper pigmentation of skin, nails and mucous membrane; chloracne; distinctive hair follicles; fever; hearing difficulties; limb spasms; headache; vomiting and diarrhea.

Fire/Explosion Hazards:

- LEAD, INORGANIC- Not considered to be a fire or explosion hazard.

- TRICHLOROETHYLENE- Combustible. POISONOUS GASES ARE PRODUCED IN FIRE. Toxic and irritating gases are produced in fire situations. (USCG, 1985)

- CADMIUM COMPOUND- Some of these materials may burn but none of them ignite readily. (DOT, 1984)

- PCBs - Some products of degeneration can pose serious long-term health risks. These problems are compounded by PCBs' resistance to biological and chemical degradation.

Fire Fighting:

- LEAD, INORGANIC- Use any means suitable for extinguishing surrounding fire. Prevent water runoff from entering sewers or water ways.

- TRICHLOROETHYLENE- Extinguish fire using agent suitable for type of surrounding fire (material itself does not burn or burns with difficulty). ((C)AAR, 1986)

- CADMIUM COMPOUND- SMALL FIRES: Dry chemical, CO_2, water spray or foam. LARGE FIRES: Water spray, fog or foam. Move container from fire area if you can do it without risk. (DOT, 1984)

- PCBs - Water spray/fog, carbon dioxide, dry chemical, or "alcohol" foam.

Non-Fire Response:

- LEAD, INORGANIC- Ventilate area of leak or spill. For spills, sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping spills may be used to avoid dust dispersal. CERCLA requires reporting spills and releases to soil, water and air in excess of reportable quantities.

- TRICHLOROETHYLENE-Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Land spill: Dig a pit, pond, lagoon, holding area to contain liquid or solid material. Dike surface flow using soil, sand bags, foamed polyurethane, or foamed concrete. Absorb bulk liquid with fly ash or cement powder. Water spill: If dissolved, apply activated carbon at ten times the spilled amount in region of 10 ppm or greater concentration. Remove trapped material with suction hoses. Use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. Air spill: Apply water spray or mist to knock down vapors. Combustion products include corrosive or toxic vapors. ((C)AAR, 1986)

- CADMIUM COMPOUND- Do not touch spilled material; stop leak if you can do it without risk. SMALL SPILLS: Take up with sand or other noncombustible absorbent material and place into containers for later disposal. SMALL DRY SPILLS: With clean shovel place material into clean, dry container and cover; move containers from spill area. LARGE SPILLS: Dike far ahead of spill for later disposal. (DOT, 1984)

- PCBs - Treat any accidental release of PCBs as an emergency. Notify safety personnel., evacuate nonessential personnel, ventilate the spill area and contain the PCBs.

First Aid:

- LEAD, INORGANIC- If swallowed, induce vomiting. If inhaled, remove to fresh air and administer oxygen as necessary. In case of contact, immediately flush eyes or skin with water for at least 15 minutes. In all cases of exposure, seek medical attention.

- TRICHLOROETHYLENE- If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates through the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1987)

- CADMIUM COMPOUND- If this chemical comes in contact with the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. If this chemical comes in contact with the skin, wash the contaminated skin with

soap and water. If a person breathes in large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1987)

- PCBs - EYES - immediately flush eyes, including under the eyelids gently but with flooding amounts for 15 minutes. SKIN - rinse exposed skin with flooding amounts of water, wash with soap and water. INHALATION - remove person to fresh air and have medical personnel administer oxygen as required. INGESTION - induce vomiting by inserting finger in back of throat. Drink 1 to 2 glasses of milk or water and seek medical attention.

Section 4.0

4.0 PERSONNEL TRAINING REQUIREMENTS

Consistent with OSHA's 29 CFR 1910.120 regulation covering Hazardous Waste Operations and Emergency Response, all site personnel are required to be trained in accordance with the standard. At a minimum all personnel are required to be trained to recognize the hazards on-site, the provisions of this HASP, and the responsible personnel.

4.1 Preassignment and Annual Refresher Training - Prior to arrival on site, each employer will be responsible for certifying that his/her employees meet the requirements of preassignment training, consistent with OSHA 29 CFR 1910.120 paragraph (e)(3). The employer should be able to provide a document certifying that each general site worker has received 40 hours of instruction off the Site, and 24 hours of training for any workers who are on site only occasionally for a specific task. If an individual employee has work experience and/or training that is equivalent to that provided in the initial training, an employer may waive the 40-hour training so long as that equivalent experience is documented or certified. All personnel must also receive 8 hours of refresher training annually.

4.2 Site Supervisors Training - Consistent with OSHA 29 CFR 1910.120 paragraph (e)(8), individuals designated as Site Supervisors require an additional 8 hours of training. The following CEI individuals have completed the Site Supervisor training:

- Margaret Karolyi (Project Manager and HSO alternate)
- Lisa Meagher (designated HSO)
- Bruce Shabino (HSO alternate)
- Samuel Bodine (Technical Assistant)

4.3 Training and Briefing Topics - The following items will be discussed by a qualified individual at the Site pre-entry briefing(s) or periodic site briefings.

- Training

- Air Monitoring, Sec. 7.0; [29 CFR 1910.120(h)]
- Chemical hazards, Table 3.1
- Emergency response plan, Sec. 10.0; [29 CFR 1910.120(l)]
- Engineering controls and work practices
- Handling drums and containers, [29 CFR 1910.120(j)]
- Heavy machinery
- Medical surveillance requirements
- Overhead and underground utilities
- Personnel protective equipment, Sec. 5.0
- Respiratory protection, Sec. 5.0 [29 CFR 1910.134]
- Physical hazards, Table 3.2
- Site control, Sec. 8.0; [29 CFR 1910.120(d)]
- Site characterization and analysis, Sec. 3.0
- Training requirements, Sec. 4.0; [29 CFR 1910.120(e)]
- Tools, [29 CFR 1910.242 - .247]
- Symptoms of overexposure to hazards

The Site Supervisor shall fill out a form which documenting that daily meetings were held to discuss potential site hazards and the associated task analyses. Copies of the sample form are included in Attachment A.

5.0 PERSONAL PROTECTIVE EQUIPMENT TO BE USED

This Section describes the general requirements of the EPA designated Levels of Protection (A-D), and the specific levels of protection required for each task at the Site.

5.1 Levels of Protection - Personnel wear protective equipment when response activities involve known or suspected atmospheric contamination vapors, gases, or particulates may be generated by site activities, or when direct contact with skin-affecting substances may occur. Full facepiece respirators protect lungs, gastrointestinal tract, and eyes against airborne toxicant. Chemical-resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals.

The specific levels of protection and necessary components for each have been divided into four categories according to the degrees of protection afforded:

- Level A: Should be worn when the highest level of respiratory, skin, and eye protection is needed.

- Level B: Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection. Level B is the primary level of choice when encountering unknown environments.

- Level C: Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.

- Level D: Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.

Modifications of these levels are permitted, and routinely employed during site work activities to maximize efficiency. For example, Level C respiratory protection and Level D skin protection may

be required for a given task. Likewise the type of chemical protective ensemble (i.e., material, format) will depend upon contaminants and degrees of contact.

The Level of Protection selected is based upon the following:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- Potential for exposure to substances in air liquids, or other direct contact with material due to work being done.
- Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better identified.

5.2 Level A Personnel Protective Equipment - CEI notes that Level A PPE is not anticipated for this project. The Level A PPE is listed below.

- Supplied-air respirator approved by the Mine Safety and Health Administration (MSHA) and National Institute for Occupational Safety and Health (NIOSH). Respirators may be positive pressure-demand, self-contained breathing apparatus (SCBA), or positive pressure-demand, airline respirator (with escape bottle for Immediately Dangerous to Life and Health (IDLH) or potential for IDLH atmospheres)
- Fully encapsulating chemical-resistant suit
- Coveralls
- Long cotton underwear
- Gloves (inner)

- Boots, chemical-resistant, steel toe and shank (depending on suit construction, worn over or under suit boot)
- Hard hat (under suit)
- Disposable gloves and boot covers (worn over fully encapsulating suit)
- Cooling unit
- 2-way radio communications (intrinsically safe)

5.3 Level B Personnel Protective Equipment - CEI notes that Level B PPE is not anticipated for this project. The Level B PPE is listed below.

- Supplied-air respirator (MSHA/NIOSH approved). Respirators may be positive pressure-demand, self-contained breathing apparatus (SCBA), or positive pressure-demand, airline respirator (with escape bottle for IDLH or potential for IDLH atmosphere)
- Chemical-resistant clothing (overalls and long-sleeved jacket; hooded, one or two-piece chemical-splash suit; disposable chemical-resistant, one-piece suits)
- Long cotton underwear
- Coveralls
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots (outer), chemical-resistant, steel toe and shank
- Boot covers (outer), chemical-resistant (disposable)
- Hard hat (face shield)
- 2-way radio communications (intrinsically safe)

5.4 Level C Personnel Protective Equipment - CEI notes that Level C PPE is not anticipated for this project. However, a modified Level D PPE may be applied to include Level C breathing apparatus. The Level C PPE is listed below.

- Air-purifying respirator, full-face, cartridge-equipped (MSHA/NIOSH approved)

- Chemical-resistant clothing (coveralls; hooded, one-piece or two-piece chemical splash suit; chemical-resistant hood and apron; disposable chemical-resistant coveralls)
- Coveralls
- Long cotton underwear
- Gloves (outer), chemical-resistant
- Gloves (inner), chemical-resistant
- Boots (outer), chemical-resistant, steel toe and shank
- Boot covers (outer), chemical-resistant (disposable)
- Hard hat (face shield)
- Escape mask
- 2-way radio communications (intrinsically safe)

5.5 Level D Personnel Protective Equipment - CEI anticipates using Level D PPE for this project. If air monitoring (refer to Section 7.0) indicates that an increased level of respiratory protection is appropriate, the Level D PPE may be modified to include Level C breathing apparatus (full-face, cartridge-equipped, air purifying respirator). The Level D PPE is listed below.

- Coveralls
- Gloves
- Boots/shoes, leather or chemical-resistant, steel toe and shank
- Safety glasses
- Hard hat

5.6 Reassessment of Protection Program - The Level of Protection provided by PPE selection shall be upgraded or downgraded based upon a change in site conditions or findings of investigations. When a significant change occurs, the hazards should be reassessed. Some indicators of the need for reassessment are:

- Commencement of a new work phase, such as the start of drum sampling or work that begins on a different portion of the Site.

- Change in job tasks during a work phase.
- Change of season/weather.
- When temperature extremes or individual medical considerations limit the effectiveness of PPE.
- Contaminants other than those previously identified are encountered.
- Change in ambient levels of contaminants.
- Change in work scope which effects the degree of contact with contaminants.

5.7 Work Mission Duration - Before the workers actually begin work in their PPE ensembles the anticipated duration of the work mission should be established. Several factors limit mission length, including:

- Air supply consumption (SCBA use).
- Suit/Ensemble permeation and penetration rates for chemicals (Section 5.8).
- Ambient temperature and weather conditions (heat stress - Section 8.7 and cold stress - Section 8.8).
- Capacity of personnel to work in PPE.

5.8 Chemical Resistance and Integrity of Protective Material - The following specific clothing materials are recommended for the Site (Level D):

- Inner Gloves - Polyvinyl chloride (PVC) or Nitrile
- Boots/Boot Covers - Steel Toe (plus disposable boot covers during off-site ditch sampling)
- Outer Gloves - PVC for soil/ground water sampling
  - "Silver Shields" for sediment sampling
- Outer Garment/Coveralls - Work clothes

If the results of field air monitoring indicate an increased level of breathing protection is appropriate, the PPE may be modified to include Level C breathing apparatus.

5.9 SOP for Respiratory Protection Devices - The SOPs contained in CEI's Quality Assurance Project Plan define standard operating procedures for air purifying respirators and self-contained breathing apparatus. In compliance with CFR §1910.134, CEI maintains a Respirator Protection Plan for its employees. The text portion of this Plan is included as Attachment C and its associated records are maintained at CEI's offices.

5.10 SOP for Personal Protective Equipment - Proper inspection of PPE features several sequences of inspection depending upon specific articles of PPE and its frequency of use. The different levels of inspection are as follows:

- Inspection and operational testing of equipment received from the factory or distributor.
- Inspection of equipment as it is issued to workers.
- Inspection after use or training and prior to maintenance.
- Periodic inspection of stored equipment.
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise. The primary inspection of PPE in use for activities at the Site will occur prior to immediate use and will be conducted by the user. This ensures that the specific device or article has been checked-out by the user that the user is familiar with its use.

TABLE 5.1 SAMPLE PPE INSPECTION CHECKLISTS

CLOTHING

Before use:

- Determine that the clothing material is correct for the specified task at hand.
- Visually inspect for:
  -imperfect seams
  -non-uniform coatings
  -tears
  -malfunctioning closures.
- Hold up to light and check for pinholes.
- Flex product:
  -observe for cracks
  -observe for other signs of shelf deterioration.
- If the product has been used previously, inspect inside and out for signs of chemical attack:
  -discoloration
  -swelling
  -stiffness.

During the work task:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- Closure failure.
- Tears.
- Punctures.
- Seam Discontinuities.

GLOVES

Before use:

- Visually inspect for:
  -imperfect seams
  -tears
  -non-uniform coating
  -pressurize glove with air; listen for pin-hole leaks.

5.11 Specific Levels of Protection Planned for the Site - The following levels of protection will be utilized during activities at the Site:

- ☐ Level D for soil and ground water sampling — Concur: _____
- ☐ Modified Level D for sediment sampling (include disposable boot covers and "Silver Shields" as outer gloves) — Concur: _____
- ☐ Modified Level D for soil sampling, as necessary (include Level C full-face air-purifying respirator, cartridge-equipped) — Concur: _____

Table 5.2 presents the level of protection planned for the completion of individual task assignments and the specific components of each protective ensemble.

Refer to Section 7.1 and to CEI's SOPs, contained in the Quality Assurance Project Plan, for further details regarding operation of the Foxboro OVA and for descriptions of field procedures, sample handling and storage, chain of custody, and laboratory and field analyses.

TABLE 5.2 SPECIFIC LEVELS OF PROTECTION PLANNED FOR THE TASK ASSIGNMENTS AT THE SITE

LEVEL A Tasks	None planned.
LEVEL A Tasks (modified)	None planned.
LEVEL B Tasks	None planned.
LEVEL B Tasks (modified)	None planned.
LEVEL C Tasks	None planned.
LEVEL C Tasks (modified)	None planned.
LEVEL D Tasks	-Soil Boring Advancement. -Soil Sampling. -Ground water monitoring well installation. -Ground water sampling.
LEVEL D Tasks (modified)	- Sediment sampling (off-site). "Silver Shields" outer gloves and disposable boot covers should be worn for protection against possible PCB-containing sediment. - Soil sampling. If elevated field air monitoring readings are obtained, Level C breathing apparatus (full-face, air-purifying respirator equipped with cartridges) should be used.

6.0 MEDICAL SURVEILLANCE REQUIREMENTS

Medical monitoring programs are designed to track the physical condition of employees on a regular basis as well as survey preemployment or baseline conditions prior to potential exposures. The medical surveillance program is a part of each employers Health and Safety Program.

6.1 Baseline or Preassignment Monitoring - Prior to being assigned to a hazardous or a potentially hazardous activity involving exposure to toxic materials, employees must receive a preassignment or baseline physical. The contents of the physical is to be determined by the employer's medical consultant. As suggested by NIOSH/OSHA/USCG/EPA's *Occupational Safety & Health Guidance Manual for Hazardous Waste Site Activities*, the minimum medical monitoring requirements for work at the Site is as follows:

- Complete medical and work histories.
- Physical examination.
- Pulmonary function tests.
- Chest X-ray (every 2 years).
- EKG.
- Eye examination and visual acuity.
- Audiometry.
- Urinalysis.
- Blood chemistry and heavy metals toxicology.

The preassignment physical should categorize employees as fit-for-duty and able to wear respiratory protection.

6.2 Periodic Monitoring - In addition to a baseline physical, all employees require a periodic physical within the last 12 months unless the advising physician believes a shorter interval is appropriate. The employers medical consultant should prescribe an adequate medical which

fulfills OSHA 29 CFR 1910.120 requirements. The preassignment medical outlined above may be applicable.

All personnel working in contaminated or potentially contaminated areas at the Site will verify their medical monitoring is current (within 12 months). This is done by indicating date of last physical on the safety plan agreement form.

6.3 Site Specific Medical Monitoring - No site-specific medical monitoring is required.

6.4 Exposure/Injury/Medical Support - As a follow-up to an injury or possible exposure above established exposure limits, all employees are entitled to and encouraged to seek medical attention and physical testing.

Depending upon the type of exposure, it is critical to perform follow-up testing within 24-48 hours. It will be up to the employers medical consultant to advise the type of test required to accurately monitor for exposure effects.

6.5 Exit Physical - At termination of employment or reassignment to an activity or location which does not represent a risk of exposure to hazardous substances, an employee shall require an exit physical. If his/her last physical was within the last 6 months, the advising medical consultant has the right to determine adequacy and necessity of exit exam.

7.0 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING

This Section explains the general concepts of an air monitoring program and specifies the surveillance activities that will take place during project completion at the Site. The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of worker protection needed. Initial screening for identification is often qualitative, i.e., the contaminant, or the class to which it belongs, is demonstrated to be present but the determination of its concentration (quantification) must await subsequent testing. Two principal approaches are available for identifying and/or quantifying airborne contaminants:

- The on-site use of direct-reading instruments.
- Laboratory analysis of air samples obtained by gas sampling bag, collection media (i.e., filter, sorbent), and/or wet-contaminant collection methods.

7.1 Direct-Reading Monitoring Instruments - Unlike air sampling devices, which are used to collect samples for subsequent analysis in a laboratory, direct-reading instruments provide information at the time of sampling, enabling rapid decision-making. Data obtained from the real-time monitors are used to assure proper selection of personnel protection equipment, engineering controls, and work practices. Overall, the instruments provide the user the capability to determine if site personnel are being exposed to concentrations which exceed exposure limits or action levels for specific hazardous materials. Of significant importance, especially during initial entries, is the potential for IDLH conditions or oxygen deficient atmospheres. Real-time monitors can be useful in identifying any IDLH conditions, toxic levels of airborne contaminants, flammable atmospheres, or radioactive hazards. Periodic monitoring of conditions is critical, especially if exposures may have increased since initial monitoring or if new site activities have commenced.

Table 7.1, excerpted from *Occupational Safety and Health Guidelines for Hazardous Waste Site Activities*, provides an overview of available monitoring instrumentation and their specific operating parameters. CEI intends to conduct field air monitoring with a Foxboro OVA, equipped with an extension handle. If elevated field air monitoring readings are obtained, CEI will upgrade to Level

C respiratory protection (refer to Section 5.8). The field air monitoring activities will be conducted in accordance with CEI's SOP, as included in CEI's Quality Assurance Project Plan.

After site mitigation activities have commenced, the selective monitoring of high-risk workers, i.e., those who are closest to the source of contaminant generation, is essential. Personal monitoring samples should be collected in the breathing zone and, if workers are wearing respiratory protective equipment, outside the facepiece. Those employees working closest with the source have the highest likelihood of being exposed to concentrations which exceed established exposure limits. Representative sampling approaches emphasizing worst case conditions, those employees with the greatest risk of exposure, is acceptable. However, the sampling strategy may change if the operation or tasks change on site or if exposures potentially increase.

TABLE 7.1 SOME DIRECT-READING INSTRUMENTS FOR GENERAL SURVEY

Instrument:	**Combustible gas indicator (CGI)**
Hazard Monitored:	Combustible gases and vapors.
Application:	Measures the concentration of a combustible gas or vapor.
Detection Method:	A filament, usually made of platinum, is heated by burning the combustible gas of vapor. The increase in heat is measured. Gases and vapors are ionized in a flame. A current is produced in proportion to the number of carbon atoms present.
General Care/Maintenance:	Recharge or replace battery. Calibrate immediately before use.
Typical Operating Time:	Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

Instrument:	**Flame Ionization Detector (FID) with Gas Chromatography Option.**
Example:	Foxboro OVA.
Hazard Monitored:	Many organic gases and vapors.
Application:	-In survey mode, detects the concentration of many organic gases and vapors. In gas chromatography (GC) mode identifies and measures specific compounds. In survey mode, all the organic compounds are ionized and detected at the same time. -In GC mode, volatile species are separated.
General Care/Maintenance:	Recharge or replace battery. Monitor fuel and/or combustion air supply gauges. Perform routine maintenance as described in the manual. Check for leaks.
Typical Operating Time:	8 hours; 3 hours with strip chart recorder.

TABLE 7.1 (Continued)

Instrument:	**Portable Infrared (IR) Spectrophotometer**
Hazard Monitored:	Many gases and vapors.
Application:	Measures concentration of many gases and vapors in air. Designed to quantify one or two component mixtures.
Detection Method:	Passes different frequencies of IR through the sample. The frequencies absorbed are specific for each compound.
General Care/Maintenance:	As specified by manufacturer.

Instrument:	**Ultraviolet (UV) Photoionization Detector (PID)**
Example:	HNU.
Hazard Monitored:	Many organic and some inorganic gases and vapors.
Application:	Detects total concentration of many organic and some inorganic gases and vapors. Some identification of compounds are possible if more than one probe is measured.
Detection Method:	Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions.
General Care/Maintenance:	Recharge or replace battery. Regularly clean lamp window. Regularly clean an maintain the instrument and accessories.
Typical Operating Time:	10 hours. 5 hours with strip chart recorder.

TABLE 7.1 (Continued)

Instrument:	**Oxygen Meter**
Hazard Monitored:	Oxygen (O_2)
Application:	Measures the percentage of O_2 in the air.
Detection Method:	Uses an electrochemical sensor to measure the partial pressure of O_2 in the air, and converts that reading to O_2 concentration.
General Care/Maintenance:	Replace detector cell according to manufacturers recommendations. Recharge or replace batteries prior to expiration of the specified interval. If the ambient air is more than 0.5% CO_2, replace the detector cell frequently.
Typical Operating Time:	8-12 hours.

Instrument:	**Real Time Aerosol Monitor**
Hazard Monitored:	Particulates
Application:	Measures total particulates in air.
Detection Method:	Uses an internal light source. The particulates defract the light beam and the amount of diffraction is converted into concentration (mg/m^3).
General Care/Maintenance:	Recharge batteries. Replace desiccant when necessary.
Typical Operating Time:	8-12 hours.

Instrument:	**Monitox**
Hazard Monitored:	Gases and Vapors
Application:	Measures specific gases and vapors
Detection Method:	Electrochemical sensor relatively specific for the chemical species in question.
General Care/Maintenance:	Moisten sponge before use; check the function switch; change the battery when needed.

TABLE 7.1 (Continued)

Instruments:	**Gamma Radiation Survey Instrument**
Hazard Monitored:	Gamma Radiation
Application:	Environmental radiation monitor
Detection Method:	Scintillation detector
General Care/Maintenance:	Must be calibrated annually at a specialized facility.
Typical Operating Time:	Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

8.0 SITE CONTROL MEASURES

Specific field activities associated with any subterranean investigations may include emplacing soil borings, soil sampling, constructing ground water monitoring wells, and ground water sampling, as necessary.

8.1 Buddy System - When some conditions present a risk to personnel, the implementation of a buddy system is mandatory. A buddy system requires at least two people who work as a team; each looking out for each other. For example, Level B operations generally require three people. Table 8.1 lists those tasks which require a buddy system and any additional site control requirements.

8.2 Site Communications Plan - Successful communications between field teams and contact with personnel in the support zone is essential. The following communications systems will be available during activities at the Site:

- Two-way radio
- Hand Signals

Signal	Definition
Hands clutching throat	Out of air/cannot breath
Hands on top of head	Need assistance
Thumbs up	OK/I am all right/I understand
Thumbs down	No/negative
Arms waving upright	Send backup support
Grip partner's wrist	Exit area immediately

8.3 Work Zone Definition - The three general work zones established at the Site are the Exclusion Zone, Contamination Reduction Zone, and Support Zone. Figure 8.2, excerpted from the NIOSH/OSHA/USCG/EPA *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, pictorially represents the three general work zones. The Exclusion Zone is defined

as the area where contamination is either known or likely to be present, or because of activity, will provide a potential to cause harm to personnel. Entry into the Exclusion Zone requires the use of personnel protective equipment. The Contamination Reduction Zone is the area where personnel conduct personal and equipment decontamination. It is essentially a buffer zone between contaminated areas and clean areas. Activities to be conducted in this zone will require personal protection as defined in the decontamination plan. The Support Zone is situated in clean areas where the chance to encounter hazardous materials or conditions is minimal. Personal protective equipment is therefore not required in the Support Zone.

For this project, CEI will use cones and/or caution tape to establish a 20-foot radius around the working areas and decontamination areas. The area inside this 20-foot radius will serve as both the Exclusion Zone and the Contamination Reduction Zone. Areas outside of this 20-foot radius will be considered Support Zones and safe areas for visitors. This radius may be extended at the discretion of the Site Supervisor or HSO.

8.4 Nearest Medical Assistance - Figures 8.1a and 8.1b provide maps of the route to the two nearest medical facilities which can provide emergency care for individuals who may experience an injury or exposure on site. The route to the hospital should be verified by the HSO, and should be familiar to all site personnel. All CEI employees have current certification in CPR and/or first aid.

8.5 Safe Work Practices - Table 8.2 provides a list of standing orders for the Exclusion Zone. Table 8.3 provides a list of standing orders for the Contamination Reduction Zone.

8.6 Soil Boring and Sampling Activities - Specific field activities associated with any subterranean investigations may include emplacing soil borings, soil sampling, constructing ground water monitoring wells, and ground water sampling, as necessary. As listed in Table 3.2, hazards connected with these activities include dangers associated with the operation of heavy machinery (i.e a probing machine or drill rig) and the potential for exposure to unknown contaminants while collecting samples. On-site personnel will wear steel-toed boots, hard hats, safety glasses and

protective sampling gloves to reduce their potential for harm. On-site personnel will also be instructed to be aware of drilling activities, listen for backup alarms and keep a safe distance from the boring while the drill rig is operating.

8.7 Heat Stress - Heat stress, due to protective clothing decreasing body ventilation, is an important factor. Heat stress of employees on site will be monitored by the American Red Cross method of monitoring heart rates as personnel come out for rest and cooling off.

One or more of the following control measures can be used to help control heat stress and are mandatory if heat stress is detected by elevated heart rate above 110 beats per minute.

1. Employees should drink plenty of water throughout the day and should increase their salt intake slightly.
2. On-site drinking water will be kept cool, 10-15°C (50-60°F), to encourage personnel to drink often.
3. A work regimen that will provide adequate rest periods for cooling down will be established as required.
4. All personnel will be advised of the dangers and symptoms of heat stroke and exhaustion.
5. Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.
6. Employees will be admonished to monitor themselves and their co-workers for the effects of heat disorders and to take additional breaks as needed.
7. All breaks are taken in a shaded rest area.
8. Employees will not do other tasks during rest periods.
9. Employees will remove impermeable garments during rest periods.
10. All employees will be informed of the importance of adequate rest, acclimatization and proper diet in the prevention of heat stress.

8.7.1 Signs and Symptoms - The signs and symptoms of varying degrees of heat stress are outlined below.

Heat Cramps:

Heat cramps are caused by heavy sweating and inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet and abdomen.

Heat Exhaustion:

Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:

- Pale, cool, moist skin
- Heavy sweating
- Dizziness, Nausea
- Fainting

Heat Stroke:

Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury or death occur. Competent medical help must be obtained immediately. This is a true medical emergency. Signs and symptoms are:

- Red, hot, usually dry skin
- Lack of or reduced perspiration
- Nausea
- Dizziness and confusion
- Strong, rapid pulse initially
- Coma

8.8 Cold Stress - Most cold-related worker fatalities have resulted from failure to escape low environmental air temperatures, or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is a fall in the deep core temperature of the body.

Employees should be protected from exposure to cold so that the deep core temperature does not fall below 36°C (98.6°F.) Lower body temperature will very likely result in reduced mental alertness, reduction in rational decision making, or loss of consciousness with the threat of fatal consequences.

- Workers will be provided with warm clothing, such as mittens and heavy socks, when the air temperature is below 4-7°C (40-45°F.) Protective clothing may be used to protect the employee.
- When the air temperature is below 0-7°C (32-40°F) (depending on employee comfort), clothing for warmth, in addition to protective clothing will be provided. This will include:

    1. Insulated suits, such as whole-body thermal underwear;
    2. Wool socks or polypropylene socks to keep moisture off the feet if there is a potential of work activity which would cause sweating;
    3. Insulated gloves;
    4. Boots; and
    5. Insulated head cover, such as knit caps.

- At air temperature below 2°C (35°F) the following work practices must be followed:

    1. If the clothing of an employee might become wet on the job site, the outer layer of the clothing must be impermeable to water.
    2. If an employee's underclothing (socks, mittens, etc.) becomes wet in any way, the employee must change into dry clothing immediately. If the clothing becomes wet from sweating, the employee may finish the task which caused the sweating before changing into dry clothing.
    3. Employees must be provided a warm area, 18°C (65°)F or above, to change from work clothing into street clothing.
    4. Employees must be provided a warm break area, 15°C (60°F) or above.

5. Hot liquids, such as soups, warm, sweet drinks, will be provided in the break area. The intake of coffee will be limited because of the attendant diuretic and circulatory effects.
6. The buddy system will be practiced at all times. Any employee observed with severe shivering will leave the cold area immediately.
7. Employees should layer their clothing. Thinner, lighter clothing should be worn next to the body with heavier clothing layered outside the inner clothing.
8. Avoid overdressing when going into warm areas or when performing activities which are strenuous. This could lead to heat stress problems.
9. Employees handling volatile liquids (such as gasoline, hexane, alcohol) will take special precautions to avoid spilling liquids on clothing or gloves because of the added danger of cold injury by evaporative cooling.

8.9 Dust and Spill Control - During subterranean investigations, contaminated dust could pose a potential hazard, because of this, dust control and suppression may be necessary to protect personnel, the community, and the environment. Depending on the moisture content of the exposed site soils, the application of water may be necessary to control and suppress dust from dry, exposed soil surfaces. If excessive particulates emissions (dust) are visually observed during the boring activities, the Site Supervisor will instruct CEI's contractors/subcontractors to apply water as a dust suppression control.

Due to the very low potential for the use of potentially hazardous liquids in this project, the need for spill control is not anticipated.

8.10 Hearing Conservation - All personnel on site will wear hearing protection while operating heavy equipment. If on-site personnel are subjected to noise exceeding an 8-hour, time-weighted average sound level of 90 dBA (decibels on the A-weighted scale), feasible administrative or engineering controls will be utilized. In addition, whenever noise exposure equals or exceeds an 8-hour, time-weighted average sound level of 85 dBA, a hearing conservation program, as described in 29 CFR 1910.95, will be employed. During the field activities involving heavy equipment, CEI

will use a digital sound level meeter (Sper Scientific model 840029) to periodically monitor the noise levels at the site. CEI's SOP for using the digital sound level meter is included in the Quality Assurance Project Plan.

8.11 Fall Protection - The walking and working surfaces will become wet, muddy and slippery during rain. Use extra caution when working on muddy ground.

8.12 Emergency Alarm Procedures - The warning signals described in Section 10.4 "Evacuation Routes and Procedures," will be deployed in the event of an emergency. Communication signals will also be used according to Section 8.2.

TABLE 8.1 PERSONNEL REQUIREMENTS

Task	Control Measures	Comments
Off-site activities	Buddy system	

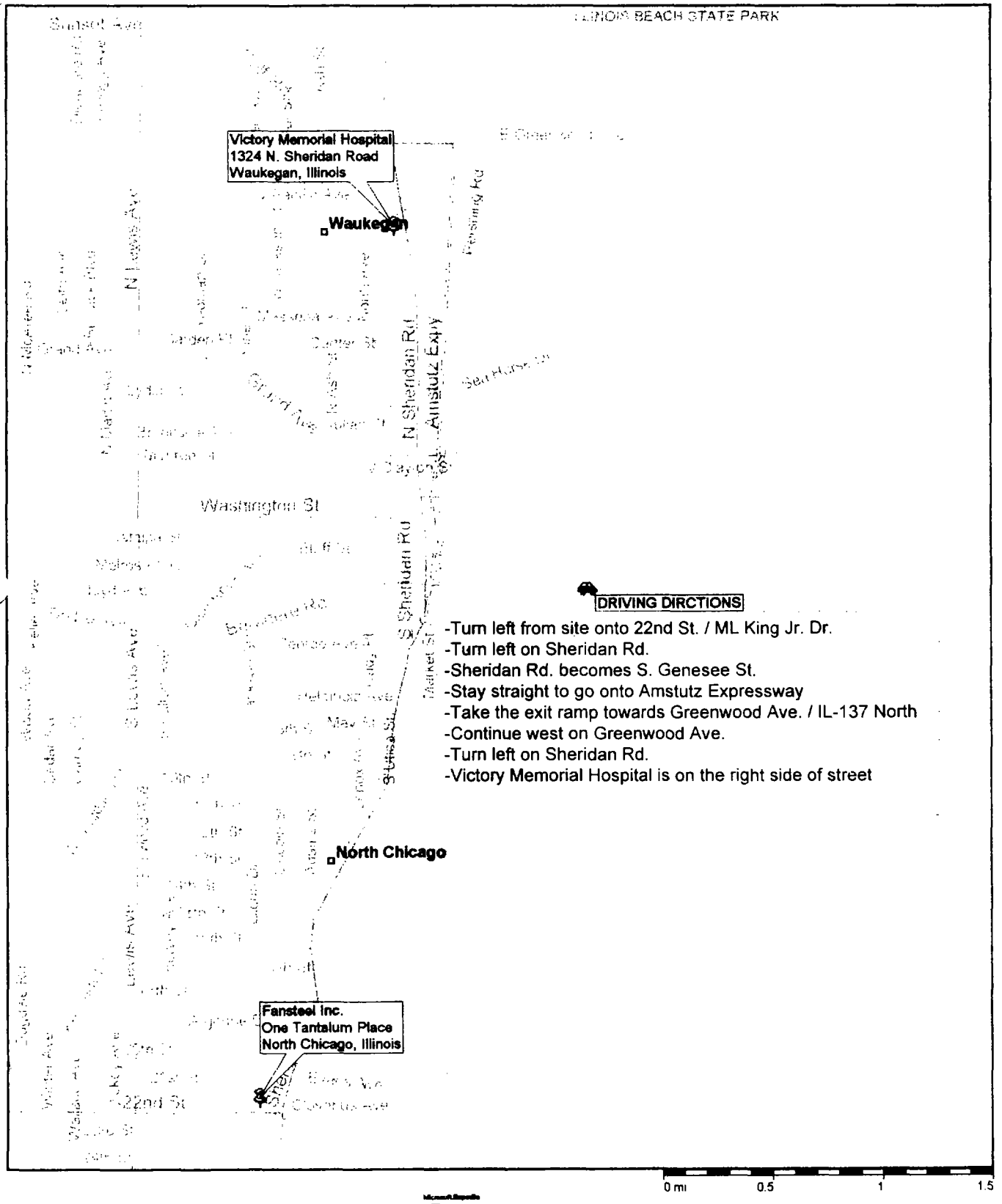
TABLE 8.2 STANDING ORDERS FOR EXCLUSION ZONE

- No smoking, eating, or drinking in this zone.
- No horse play.
- No matches or lighters in this zone.
- Check-in on entrance to this zone.
- Check-out on exit from this zone.
- Implement the communications system.
- Line of sight must be in position.
- Wear the appropriate level of protection as defined in the Safety Plan.

TABLE 8.3 STANDING ORDERS FOR CONTAMINATION REDUCTION ZONE

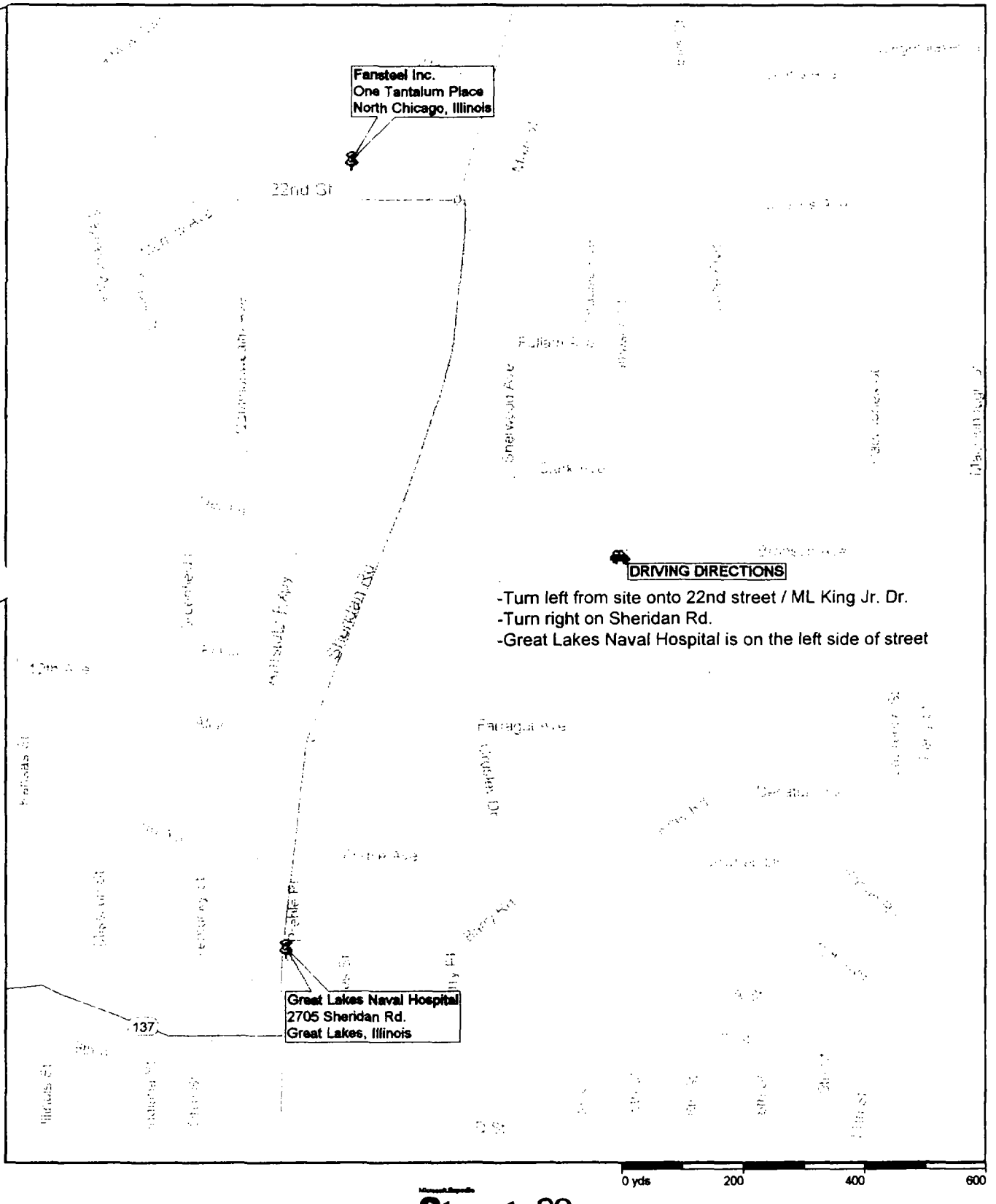
- No smoking, eating, or drinking in this zone.
- No horse play.
- No matches or lighters in this zone.
- Wear the appropriate level of protection.

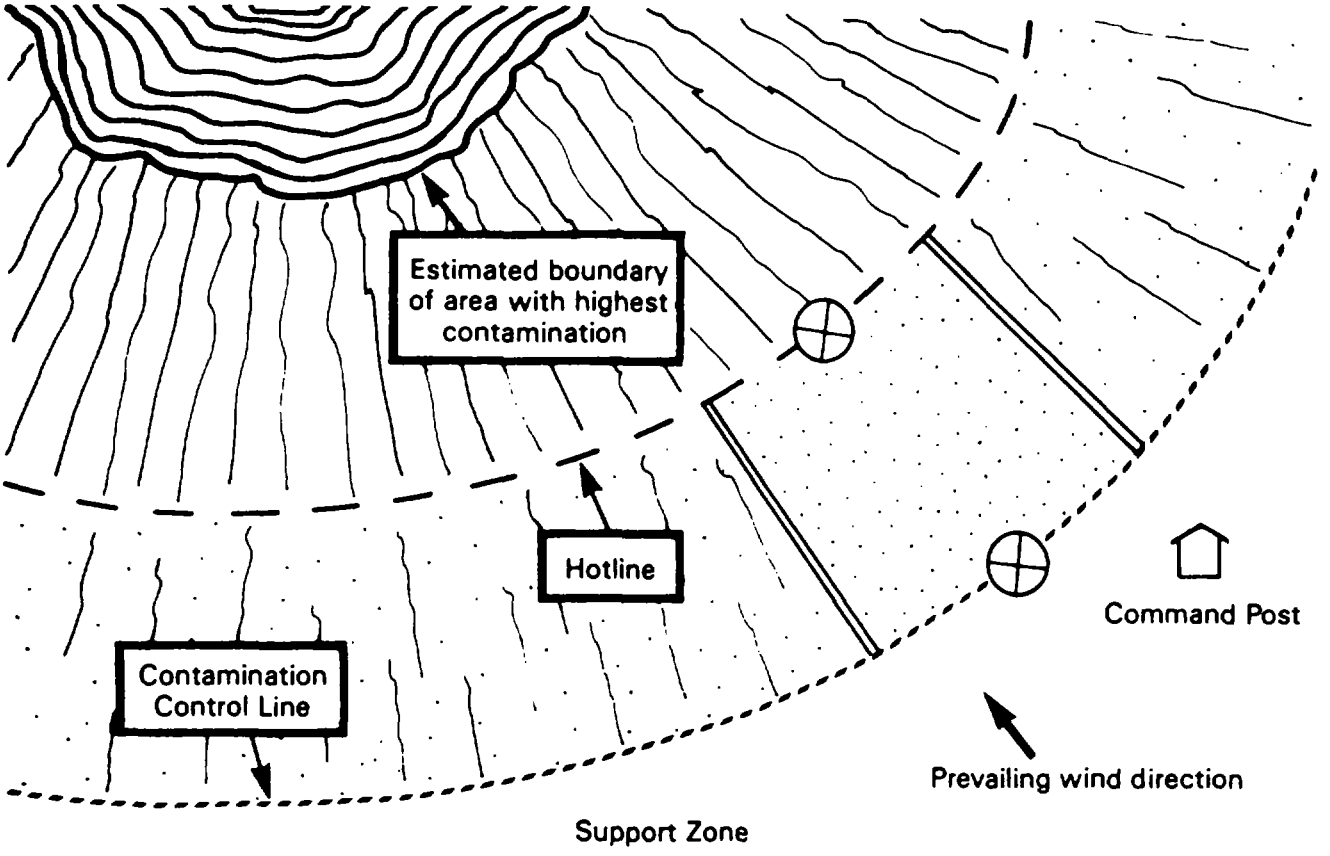
FIGURE 8.1a
DRIVING DIRECTIONS FROM SITE TO VICTORY MEMORIAL HOSPITAL



Streets98

FIGURE 8.1b
DRIVING DIRECTIONS FROM SITE TO GREAT LAKES NAVAL HOSPITAL





Access Control Points.

Contamination Reduction Corridor.

Contamination Reduction Zone (CRZ).

Exclusion Zone.

Note: Area dimensions not to scale. Distances between points may vary.

Note :

This figure showing the delineation of sampling site work zones was adapted from 9-1 of NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.

Please refer to Section 8.3 of the HASP for more information regarding the establishment of work zones at the site.

Figure 8.2
Sample Site Work Zones
Fansteel, Inc.
One Tantalum Place
North Chicago, Illinois

CARLSON ENVIRONMENTAL, INC.
312 W. RANDOLPH STREET
CHICAGO, ILLINOIS
(312) 346-2140

DRW. JLF
PH. 9646C
DATE 1/20/98
SCALE NONE

9.0 DECONTAMINATION PLAN

Table 5.2 lists the tasks and specific levels of protection required for each task. Consistent with the levels of protection required, the decontamination figures (Figures 9.1 through 9.4) provide a step by step representation of the personnel decontamination process for either Level A, B, or C. These procedures should be modified to suit site conditions and protective ensembles in use.

9.1 Standard Operating Procedures - Decontamination involves the orderly controlled removal of contaminants. Standard decontamination sequences are presented in the decontamination figure. All site personnel should minimize contact with contaminants in order to minimize the need for extensive decontamination.

9.2 Levels of Decontamination Protection Required for Personnel - The levels of protection required for personnel assisting with decontamination will be Level D. The Site Safety Officer is responsible for monitoring decontamination procedures and determining their effectiveness.

9.3 Equipment Decontamination - Sampling equipment will be decontaminated in accordance with procedures as defined in the Site Investigation Work Plan, Section 4.4. The sequence of decontamination steps required for non-sampling equipment and heavy machinery can be found in CEI's Quality Assurance Project Plan.

9.4 Disposition of Decontamination Wastes - All equipment and solvents used for decontamination shall be decontaminated or disposed of properly. Commercial laundries or cleaning establishments that decontaminate protective clothing or equipment shall be informed of the potentially harmful effects of exposures.

FIGURE 9.1 LEVEL A DECONTAMINATION STEPS

Step 1	Segregated equipment drop
Step 2	Boot cover and glove wash
Step 3	Boot cover and glove rinse
Step 4	Tape removal - boot and glove
Step 5	Boot cover removal
Step 6	Outer glove removal
Step 7	Suit/safety boot wash
Step 8	Suit/safety boot rinse
Step 9	Safety boot removal
Step 10	Fully encapsulating suit and hard hat removal
Step 11	SCBA backpack removal
Step 12	Inner glove wash
Step 13	Inner glove rinse
Step 14	Face piece removal
Step 15	Inner glove removal
Step 16	Inner clothing removal
Step 17	Field wash
Step 18	Redress

FIGURE 9.2 LEVEL B DECONTAMINATION STEPS

Step 1	Segregated equipment drop
Step 2	Boot cover and glove wash
Step 3	Boot cover and glove rinse
Step 4	Tape removal - outer glove and boot
Step 5	Boot cover removal
Step 6	Outer glove removal
Step 7	Suit/safety boot wash
Step 8	Suit/SCBA/boot/glove rinse
Step 9	Safety boot removal
Step 10	SCBA backpack removal
Step 11	Splash suit removal
Step 12	Inner glove wash
Step 13	Inner glove rinse
Step 14	Face piece removal
Step 15	Inner glove removal
Step 16	Inner clothing removal
Step 17	Field wash
Step 18	Redress

FIGURE 9.3 LEVEL C DECONTAMINATION STEPS

Step 1	Segregated equipment drop
Step 2	Boot cover and glove wash
Step 3	Boot cover and glove rinse
Step 4	Tape removal
Step 5	Boot cover removal
Step 6	Outer glove removal
Step 7	Suit/safety boot wash
Step 8	Suit/safety boot rinse
Step 9	Safety boot removal
Step 10	Splash suit removal
Step 11	Inner glove wash
Step 12	Inner glove rinse
Step 13	Face piece removal
Step 14	Inner glove removal
Step 15	Inner clothing removal
Step 16	Field wash
Step 17	Redress

FIGURE 9.4 LEVEL D DECONTAMINATION STEPS

Step 1	Remove outer garments (i.e., coveralls)
Step 2	Remove gloves
Step 3	Wash hands and face

10.0 EMERGENCY RESPONSE/CONTINGENCY PLAN

This Section describes contingencies and emergency planning procedures to be implemented at the Site. This HASP is compatible with local, state and Federal disaster and emergency management plans as appropriate.

10.1 Pre-Emergency Planning - During the site briefings held periodically/daily, all employees will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes. Table 10.1 identifies the hazardous conditions associated with specific site activities. The plan will be reviewed and revised if necessary, on a regular basis by the HSO. This will ensure that the plan is adequate and consistent with prevailing site conditions.

10.2 Personnel Roles and Lines of Authority - The Site Supervisor has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measure to ensure the safety of site personnel and the public. Possible actions may involve evacuation of personnel from the site area, and evacuation of adjacent residents. He/she is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed. The HSO may be called upon to act on the behalf of the Site Supervisor, and will direct responses to any medical emergency. The individual contractor organizations are responsible for assisting the project manager in his/her mission within the parameters of their scope of work. The Site Supervisor(s): to be assigned. The HSO is Lisa Meagher (312/704-2216) - designated; Margaret Karolyi (312/704-8843) - alternate; Bruce Shabino (312/704-8853) - alternate.

10.3 Emergency Recognition/Prevention - Table 3.1 provides a listing of chemical and physical hazards on site. Additional potential hazards related to the site activities are listed in Table 10.1 with prevention and control techniques/mechanisms. Personnel will be familiar with techniques of hazard recognition from preassignment training and site specific briefings. The HSO is responsible for ensuring that prevention devices or equipment is available to personnel.

10.4 Evacuation Routes/Procedures - In the event of an emergency which necessitates an evacuation of the Site, the following alarm procedures will be implemented: Evacuation alarm notification should be made using three short blasts on the air horn, supplemented using the hand held radios. All personnel should evacuate upwind of any activities. Insure that a predetermined location is identified off-site in case of an emergency, so that all personnel can be accounted for. Personnel will be expected to proceed to the closest exit with your buddy, and mobilize to the safe distance area associated with the evacuation route. Personnel will remain at that area until the re-entry alarm is sounded or an authorized individual provides further instructions.

Figure 10.1 provides a map depicting evacuation routes for the Site. In the event of evacuation, personnel should exit at the south side of the Site, to 22nd Street. The main entrance/exit to the Site is located along the south fence line, just east of the Guard House, as shown on Figure 10.1.

TABLE 10.1 EMERGENCY RECOGNITION/CONTROL MEASURES

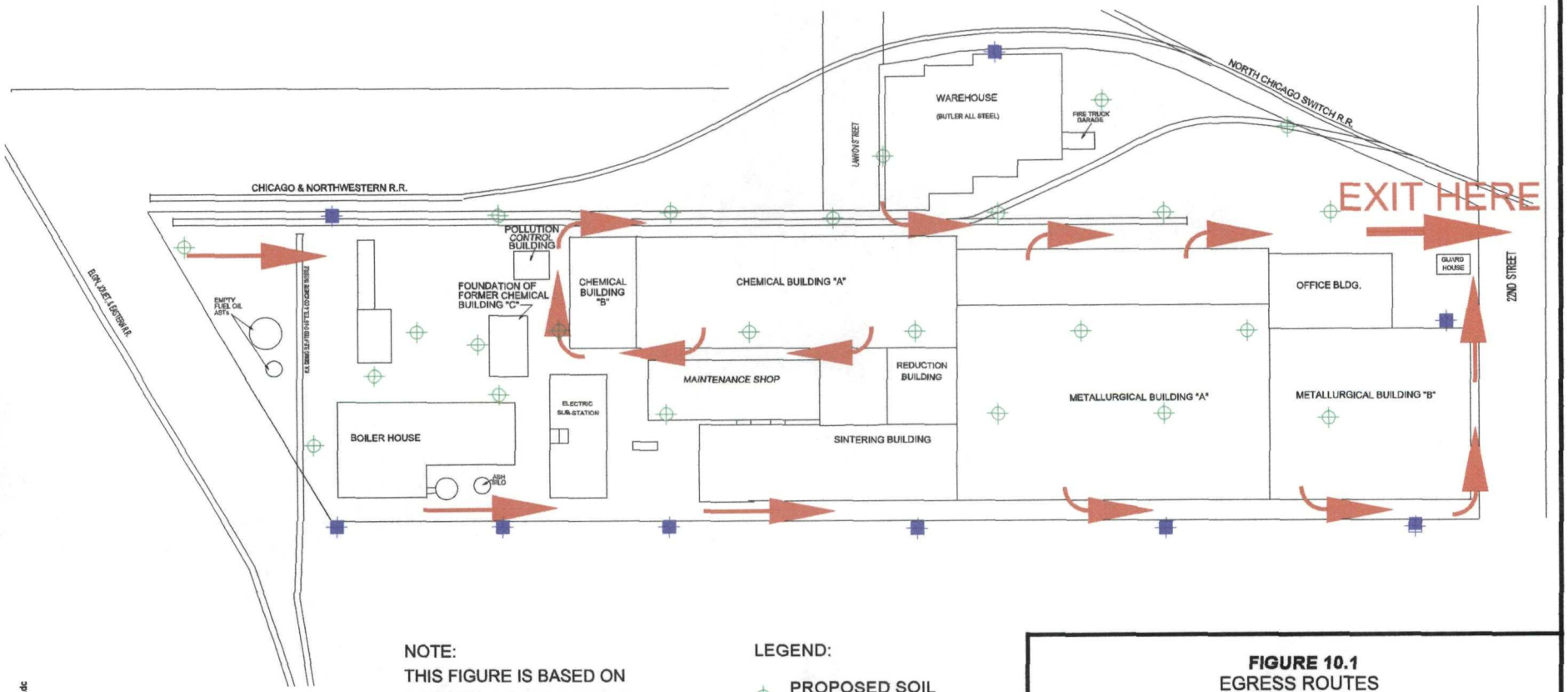
Hazard	Prevention/control	Location
Fire/Explosion	Fire Extinguisher Alarm System Fire Inspections	Fire extinguishers are located in CEI's vehicles. Additional fire extinguishers are located in the various Fansteel buildings and should be identified prior to beginning sampling activities in the buildings.
Spill	*(Berms/Dikes)* Sorbent Materials *(Foams)*	Sorbent materials are located in CEI's and the contractor's vehicles.
Air Release	Water Spray *(Foam)* *(Alarm System)* Evacuation Routes	The Geoprobe contractor will have water available to spray as a dust suppression control during the boring/well installation activities.

10.5 Emergency Contact/Notification System - The following list provides names and telephone numbers for emergency contact personnel. In the event of a medical emergency, personnel will take direction from the HSO and notify the appropriate emergency organization. In the event of a fire or spill, the Site Supervisor will notify the appropriate local, state, and federal agencies.

Organization	Contact	Telephone
Ambulance:		911
Police:		911
Fire:		911
State Police:		911
Hospital 1:	Victory Memorial Hospital	847/360-3000
Hospital 2:	Great Lakes Naval Hospital	847/688-3500
Regional EPA:	John O'Grady Remedial Project Manager	312/886-4071
EPA Emergency Response Team:		908-321-6660
National Response Center:		800-424-8802
Center for Disease Control:		404-488-4100
Chemtrec:		800-424-9555

- IF EXITING FROM THE WEST SIDE OF SITE, PROCEED SOUTH ALONG WEST END OF LOT, TURN EAST (LEFT) AND PROCEED PAST THE GUARD HOUSE, THEN EXIT SITE BY TURNING SOUTH (RIGHT) ONTO 22ND STREET / ML KING JR. DRIVE

- IF EXITING FROM THE EAST SIDE OF SITE, PROCEED SOUTH ALONG EAST END OF LOT, CONTINUE SOUTH PAST THE GUARD HOUSE AND EXIT ONTO 22ND STREET / ML KING JR. DRIVE



NOTE:
THIS FIGURE IS BASED ON A DRAWING PREPARED BY FACTORY INSURANCE ASSOCIATION AND DATED 2/9/60.

LEGEND:

- PROPOSED SOIL BORING LOCATION
- PROPOSED MONITORING WELL LOCATION

SCALE:

0 50 100 200'

FIGURE 10.1
EGRESS ROUTES
FANSTEEL, INC.
One Tantalum Place
North Chicago, Illinois

CARLSON ENVIRONMENTAL, INC.
312 W. RANDOLPH STREET
CHICAGO, ILLINOIS
(312) 346-2140

DRW: PAM
PN: 9566
DATE: 10-15-98
SCALE: None

P:\9519566A.RFI\Regressdraw.dc

10.6 Emergency Medical Treatment Procedures - Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket.) First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the Project Manager. Any person being transported to a clinic or hospital for treatment should take with them information on the chemical(s) they have been exposed to at the Site. This information is included in Table 3.1. Any vehicle used to transport contaminated personnel will be treated and cleaned as necessary.

10.7 Fire or Explosion - In the event of a fire or explosion, the local fire department should be summoned immediately. Upon their arrival, the Project Manager or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials on site. If it is safe to do so, site personnel may:

- Use fire fighting equipment available on site to control or extinguish the fire; and,
- Remove or isolate flammable or other hazardous materials which may contribute to the fire.

10.8 Spill or Leaks - In the event of a spill or a leak, site personnel will:

- Inform their supervisor immediately;
- Locate the source of the spillage and stop the flow if it can be done safely; and,
- Begin containment and recovery of the spilled materials.

10.9 Emergency Equipment/Facilities - The following emergency equipment is stored in CEI's field vehicles:

- First aid kit

- Fire extinguisher
- Mobile telephone
- Emergency SCBAs
- Eye wash
- Two-way radio

CEI does not perform overpacking activities. If overpacks are required, the Site Supervisor will exercise appropriate precautions to mitigate any immediate risk. The HSO will make arrangements for a contractor to provide overpack services (i.e., Clean Harbors Environmental Services - contact Mark Lestina at (773) 646-6202).

11.0 CONFINED SPACE ENTRY PROCEDURES

A confined space provides the potential for unusually high concentrations of contaminants, explosive atmospheres, limited visibility, and restricted movement. This Section will establish requirements for safe entry into, continued work in, and safe exit from confined spaces. Additional information regarding confined space entry can be found in 29 CFR 1926.21, 29 CFR 1910 and NIOSH 80-106.

None of CEI's employees are trained in confined space entries. However, confined space entries are not anticipated during this site investigation. If subsequent phases of investigation or remediation activities require confined space entry, only subcontractors properly trained in confined spaced entry and safety procedures will be employed.

11.1 Definitions -

- Confined Space: A space or work area not designed or intended for normal human occupancy, having limited means of egress and poor natural ventilation; and/or any structure, including buildings or rooms, which have limited means of egress.

- Confined Space Entry Permit (CSEP): A document to be initiated by the supervisor of personnel who are to enter into or work in a confined space. The Confined Space Entry Permit (CSEP) will be completed by the personnel involved in the entry and approved by the HSO before personnel will be permitted to enter the confined space. The CSEP shall be valid only for the performance of the work identified and for the location and time specified. The beginning of a new shift with change of personnel will require the issuance of a new CSEP.

- Confined Space Observer: An individual assigned to monitor the activities of personnel working within a confined space.

The confined space observer monitors and provides external assistance to those inside the confined space. The confined space observer summons rescue personnel in the event of emergency and assists the rescue team.

11.2 General Provisions -

- When possible, confined spaces should be identified with a posted sign which reads: "Caution - Confined Space".

- Only personnel trained and knowledgeable of the requirements of these Confined Space Entry Procedures will be authorized to enter a confined space or be a confined space observer.

- A CSEP must be issued prior to the performance of any work within a confined space. The CSEP will become a part of the permanent and official record of the Site.

- Natural ventilation shall be provided for the confined space prior to initial entry and for the duration of the CSEP. Positive/forced mechanical ventilation may be required. However, care should be taken to not spread contamination outside of the enclosed area.

- If flammable liquids may be contained within the confined space, explosion proof equipment will be used. All equipment shall be positively grounded.

- The contents of any confined space shall, where necessary, be removed prior to entry. All sources of ignition must be removed prior to entry.

- Hand tools used in confined spaces shall be in good repair explosion proof and spark proof, and selected according to intended use. Where possible, pneumatic power tools are to be used.

- Hand-held lights and other illumination utilized in confined spaces shall be equipped with guards to prevent contact with the bulb and must be explosion proof.

- Compressed gas cylinders, except cylinders used for self-contained breathing apparatus, shall not be taken into confined spaces. Gas hoses shall be removed from the space and the supply turned off at the cylinder valve when personnel exit from the confined space.

- If a confined space requires respiratory equipment or where rescue may be difficult, safety belts, body harnesses, and lifelines will be used. The outside observer shall be provided with the same equipment as those working within the confined space.

- A ladder is required in all confined spaces deeper than the employee's shoulders. The ladder shall be secured and not removed until all employees have exited the space.

- Only self-contained breathing apparatus or NIOSH approved airline respirators equipped with a 5-minute emergency air supply (egress bottle) shall be used in untested confined spaces or in any confined space with conditions determined immediately dangerous to life and health.

- Where air-moving equipment is used to provide ventilation, chemicals shall be removed from the vicinity to prevent introduction into the confined space.

- Vehicles shall not be left running near confined space work or near air-moving equipment being used for confined space ventilation.

- Smoking in confined spaces will be prohibited at all times.

- Any deviation from these Confined Space Entry Procedures requires the prior permission of the On-Scene Coordinator.

11.3 Procedure for Confined Space Entry - The HSO and Entry Team shall:

- Evaluate the job to be done and identify the potential hazards before a job in a confined space is scheduled.

- Ensure that all process piping, mechanical and electrical equipment, etc., have been disconnected, purged, blanked-off or locked and tagged as necessary.

- If possible, ensure removal of any standing fluids that may produce toxic or air displacing gases, vapors, or dust.

- Initiate a CSEP in concurrence with the Project Manager or designated alternative.

- Ensure that any hot work (welding, burning, open flames, or spark producing operation) that is to be performed in the confined space has been approved by the Project Manager and is indicated on the CSEP.

- Ensure that the space is ventilated before starting work in the confined space and for the duration of the time that the work is to be performed in the space.

- Ensure that the personnel who enter the confined space and the confined space observer helper are familiar with the contents and requirements of this instruction.

- Ensure remote atmospheric testing of the confined space prior to employee entry and before validation/revalidation of a CSEP to ensure the following: 1. Oxygen content between 19.5% - 23.0%. 2. No concentration of combustible gas in the space. Sampling will be done throughout the confined space and specifically at the lowest point in the space. 3. The absence of other atmospheric contaminants space has contained toxic, corrosive, or irritant material. 4. If remote testing is not possible. Level B PPE is required.

- Designate whether hot or cold work will be allowed. Complete the CSEP listing any safety precautions, protective equipment, or other requirements.

- Ensure that a copy of the CSEP is posted at the work site a copy is filed with the project supervisor, and a copy is furnished to the project manager.

The CSEP shall be considered void if work in the confined space does not start within one hour after the ventilation and atmospheric testing are performed or if significant changes within the confined space atmosphere or job scope occurs.

The CSEP posted at the work site shall be removed at the completion of the job or the end of the shift, whichever is first.

11.4 Confined Space Observer -

- While personnel are inside the confined space, a confined space observer will monitor the activities and provide external assistance to those in the space. The observer will have no other duties which may take his attention away from the work or require him to leave the vicinity of the confined space at any time while personnel are in the space.

- The confined space observer shall maintain at least voice contact with all personnel in the confined space. Visual contact is preferred, if possible.

- The observer shall be instructed by his supervisor in the method for contacting rescue personnel in the event of an emergency.

- If irregularities within the space are detected by the observer, personnel within the space will be ordered to exit.

- In the event of an emergency, the observer must NEVER enter the confined space prior to contacting and receiving assistance from a helper. Prior to this time, he should attempt to remove personnel with the lifeline and to perform all other rescue functions from outside the space.

- A helper shall be designated to provide assistance to the confined space observer in case the observer must enter the confined space to retrieve personnel.

Section 12.0

12.0 SPILL CONTAINMENT PROGRAM

The procedures defined in this Section comprise the spill containment program in place for activities at the Site.

- All drums and containers used during the clean-up shall meet the appropriate DOT, OSHA, and EPA regulators for the waste that they will contain.

- Drums and containers shall be inspected and their integrity assured prior to being moved. Drums or containers that cannot be inspected before being moved because of storage conditions, shall be positioned in an accessible location and inspected prior to further handling.

- Operations on site will be organized so as to minimize the amount of drum or container movement.

- Employees involved in the drum or container operations shall be warned of the hazards associated with the containers.

- Where spills, leaks, or ruptures may occur, adequate quantities of spill containment equipment (absorbent, pillows, etc.) will be stationed in the immediate area. The spill containment program must be sufficient to contain and isolate the entire volume of hazardous substances being transferred.

- Drums or containers that cannot be moved without failure, shall be emptied into a sound container.

- Fire extinguishing equipment meeting 29 CFR part 1910. subpart 1 shall be on hand and ready for use to control fires.

13.0 HAZARD COMMUNICATION

In order to comply with 29 CFR 1910.1200, Hazard Communication, the following written Hazard Communication Program has been established. All employees will be briefed on this program, and have a written copy for review.

13.1 Container Labeling - All containers received on site will be inspected to ensure the following:

(1) all containers will be clearly labeled as to the contents;
(2) the appropriate hazard warnings will be noted; and
(3) the name and address of the manufacturer will be listed.

All secondary containers will be labeled with either an extra copy of the original manufacturer's label or with generic labels which have a block for identify and blocks for the hazard warning.

13.2 Material Safety Data Sheets (MSD Sheets) - Copies of MSD Sheets for all hazardous chemicals known or suspected on site will be maintained in the work area. MSD Sheets will be available to all employees for review during each work shift.

The compounds listed below may be used during the proposed Site Investigation activities. MSD Sheets for these compounds are included in Attachment B.

- gasoline
- diesel fuel
- hydrochloric acid
- nitric acid
- hydrogen gas
- bentonite
- Alconox

MSD Sheets for the four known Chemical Hazards of Concern (cadmium, trichloroethene, lead, and PCBs) are included in Attachment B. In addition, significant levels of tantalum, a specialty metal known to have been used at the Site, are also expected to be encountered during the site investigation. The MSD Sheet for tantalum is also included in Attachment B.

13.3 Employee Training and Information - Prior to starting work, each employee will attend a health and safety orientation and will receive information and training on the following:

(1) an overview of the requirements contained in the Hazard Communication Standard, 29 CFR 1910.1200;
(2) chemicals present in their workplace operations;
(3) location and availability of a written hazard program;
(4) physical and health effects of the hazardous chemicals;
(5) methods and observation techniques used to determine the presence or release of hazardous chemicals;
(6) how to lessen or prevent exposure to these hazardous chemicals through usage of control/work practices and personal protective equipment;
(7) emergency procedures to follow if they are exposed to these chemicals;
(8) location of MSDS file and location of hazardous chemical list.

Attachment A -
Forms

HASP ACCEPTANCE FORM

Fansteel, Inc.

North Chicago, Illinois

Each site worker and visitor shall sign this form after site-specific training is completed and before being permitted to work on site.

I have read and understand this Health and Safety Plan. I will comply with the provisions contained therein.

Printed Name	Signature	Date	Month and Year of Most Recent Medical Monitoring

WRITTEN CERTIFICATION HAZARD ASSESSMENT

Project Number: _____ Site Name: _____

Project Manager: _____ Date: _____

Location: _____

Hazard Assessment Certified By (Site HSO or alternate): _____

1. *Site-Specific Hazard Assessment:* List tasks and physical and/or chemical hazards associated with each task (i.e., vapors, pinch points, falls, dust, etc.).

   Task_____ Hazards_____

   Task_____ Hazards_____

   Task_____ Hazards_____

   Task_____ Hazards_____

   Task_____ Hazards_____

1. *PPE Selected For Each Task:* List tasks and selected PPE.

   Task_____ PPE_____

   Task_____ PPE_____

   Task_____ PPE_____

   Task_____ PPE_____

   Task_____ PPE_____

3. A detailed listing of personal protective equipment (PPE) and task-specific procedures can be found in the site-specific HASP. If the task is not listed, please contact the HSO or Project Manager.

SITE SAFETY MEETING

Project Number: _____ Site Name: _____

Time: _____ Date: _____

Location: _____

Meeting Conducted By (HSO or alternate): _____

Summary of Items Discussed: _____

_____

_____

_____

Personnel Present

	Name	Company	Signature
1.	_____	_____	_____
2.	_____	_____	_____
3.	_____	_____	_____
4.	_____	_____	_____
5.	_____	_____	_____
6.	_____	_____	_____
7.	_____	_____	_____
8.	_____	_____	_____

Continue on Back if Necessary

HEALTH AND SAFETY PLAN
FIELD MODIFICATION FORM

Project Number: _____ Site Name: _____

CEI Representative: _____ Date: _____

Location: _____

Field Modification to HASP: _____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

Accepted By: _____
Site HSO or Alternate Date

Accepted By: _____
Project Manager Date

Both Signatures Must be Obtained

Attachment B -
MSD Sheets

1 - PRODUCT IDENTIFICATION

PRODUCT NAME: CADMIUM
FORMULA: CD
FORMULA WT: 112.40
CAS NO.: 07440-43-9
NIOSH/RTECS NO.: EU9800000
PRODUCT CODES: 1184,1182
EFFECTIVE: 09/10/86
REVISION #02

PRECAUTIONARY LABELLING

BAKER SAF-T-DATA(TM) SYSTEM

HEALTH	-	3	SEVERE (CANCER CAUSING)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	0	NONE

HAZARD RATINGS ARE 0 TO 4 (0 = NO HAZARD; 4 = EXTREME HAZARD).

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

PRECAUTIONARY LABEL STATEMENTS

WARNING
HARMFUL IF SWALLOWED OR INHALED
NOTE: REPORTED AS CAUSING CANCER IN LABORATORY ANIMALS. EXERCISE DUE CARE.
AVOID CONTACT WITH EYES, SKIN, CLOTHING.
AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

SAF-T-DATA(TM) STORAGE COLOR CODE: BLUE (HEALTH)

2 - HAZARDOUS COMPONENTS

COMPONENT	%	CAS NO.
CADMIUM	90-100	07440-43-9

3 - PHYSICAL DATA

BOILING POINT: 767 C (1413 F)
MELTING POINT: 321 C (610 F)
SPECIFIC GRAVITY: 8.64 (H2O=1)
VAPOR PRESSURE(MM HG): N/A
VAPOR DENSITY(AIR=1): 3.9
EVAPORATION RATE: N/A (BUTYL ACETATE=1)

SOLUBILITY(H2O): NEGLIGIBLE (LESS THAN 0.1 %) % VOLATILES BY VOLUME: 0

APPEARANCE & ODOR: SOFT, BLUE-WHITE SOLID.

4 - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP: N/A

FLAMMABLE LIMITS: UPPER - N/A % LOWER - N/A %

FIRE EXTINGUISHING MEDIA
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES
FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

UNUSUAL FIRE & EXPLOSION HAZARDS
CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE OR EXPLOSION.

5 - HEALTH HAZARD DATA

THIS SUBSTANCE IS LISTED AS NTP ANTICIPATED HUMAN CARCINOGEN, IARC PROBABLE HUMAN CARCINOGEN (GROUPS 2A AND 2B). THE ACCEPTABLE CEILING CONCENTRATION (PEL) IS 0.6 MG/M3.

THRESHOLD LIMIT VALUE (TLV/TWA): 0.05 MG/M3 (PPM)

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.2 MG/M3 (PPM)

TOXICITY: LD50 (ORAL-RAT) (MG/KG) - 225
LD50 (IPR-RAT) (MG/KG) - 4
LD50 (SCU-RAT) (MG/KG) - 9

CARCINOGENICITY: NTP: YES IARC: YES Z LIST: NO OSHA REG: YES

EFFECTS OF OVEREXPOSURE
OVEREXPOSURE TO VAPORS MAY CAUSE IRRITATION OF MUCOUS MEMBRANES, DRYNESS OF MOUTH AND THROAT, HEADACHE, NAUSEA AND DIZZINESS.
INHALATION MAY BE HARMFUL OR FATAL.
CHRONIC EFFECTS OF CADMIUM COMPOUNDS FROM LOW LEVEL EXPOSURE IN THE AIR MAY CAUSE IRREVERSIBLE LUNG INJURY, KIDNEY DISEASE, AND OTHER ADVERSE EFFECTS.
DUST MAY IRRITATE EYES.

TARGET ORGANS
RESPIRATORY SYSTEM, KIDNEYS, BLOOD, PROSTATE

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
NONE IDENTIFIED

ROUTES OF ENTRY
INGESTION, INHALATION

EMERGENCY AND FIRST AID PROCEDURES
CALL A PHYSICIAN.
IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

6 - REACTIVITY DATA

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

INCOMPATIBLES: STRONG OXIDIZING AGENTS, NITRATES, NITRIC ACID

---

7 - SPILL AND DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE
WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE
DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D006 (EP TOXIC WASTE)

---

8 - PROTECTIVE EQUIPMENT

ENTILATION:	USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.
RESPIRATORY PROTECTION:	RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1 PPM, A HIGH-EFFICIENCY PARTICULATE RESPIRATOR IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.
EYE/SKIN PROTECTION:	SAFETY GOGGLES, UNIFORM, APRON, RUBBER GLOVES ARE RECOMMENDED.

---

9 - STORAGE AND HANDLING PRECAUTIONS

SAF-T-DATA(TM) STORAGE COLOR CODE: BLUE (HEALTH)

SPECIAL PRECAUTIONS
KEEP CONTAINER TIGHTLY CLOSED. STORE IN SECURE POISON AREA.

---

10 - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME	CADMIUM
HAZARD CLASS	ORM-E
LABELS	NONE
REPORTABLE QUANTITY	1 LBS.

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME	POISONOUS SOLIDS, N.O.S. (CADMIUM)
HAZARD CLASS	6.1
UN/NA	UN2811
LABELS	POISON

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

TRICHLOROETHYLENE

MSDS Number: T4940 --- *Effective Date: 03/23/98*

1. Product Identification

Synonyms: Trichloroethene; TCE; acetylene trichloride; Ethinyl trichloride
CAS No.: 79-01-6
Molecular Weight: 131.39
Chemical Formula: C2HCl3
Product Codes:
J.T. Baker: 5376, 9454, 9458, 9464, 9473, 9474
Mallinckrodt: 8598, 8600, 8633

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Trichloroethylene	79-01-6	100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. CAUSES SEVERE SKIN IRRITATION. CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Cancer Causing)
Flammability Rating: 1 - Slight
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Vapors can irritate the respiratory tract. Causes depression of the central nervous system with symptoms of visual disturbances and mental confusion, incoordination, headache, nausea, euphoria, and dizziness. Inhalation of high concentrations could cause unconsciousness, heart effects, liver effects, kidney effects, and death.

Ingestion:
Cases irritation to gastrointestinal tract. May also cause effects similar to inhalation. May cause coughing, abdominal pain, diarrhea, dizziness, pulmonary edema, unconsciousness. Kidney failure can result in severe cases. Estimated fatal dose is 3-5 ml/kg.

Skin Contact:
Cause irritation, redness and pain. Can cause blistering. Continued skin contact has a defatting action and can produce rough, dry, red skin resulting in secondary infection.

Eye Contact:
Vapors may cause severe irritation with redness and pain. Splashes may cause eye damage.

Chronic Exposure:
Chronic exposures may cause liver, kidney, central nervous system, and peripheral nervous system effects. Workers chronically exposed may exhibit central nervous system depression, intolerance to alcohol, and increased cardiac output. This material is linked to mutagenic effects in humans. This material is also a suspect carcinogen.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, cardiovascular disorders, impaired liver or kidney or respiratory function, or central or peripheral nervous system disorders may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Call a physician.

Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

5. Fire Fighting Measures

Fire:
Autoignition temperature: 420C (788F)
Flammable limits in air % by volume:
lel: 8; uel: 12.5
Explosion:
A strong ignition source, e. g., a welding torch, can produce ignition. Sealed containers may rupture when heated.
Fire Extinguishing Media:
Use water spray to keep fire exposed containers cool. If substance does ignite, use CO2, dry chemical or foam.
Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Combustion by-products include phosgene and hydrogen chloride gases. Structural firefighters' clothing provides only limited protection to the combustion products of this material.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Isolate from incompatible substances. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Trichloroethylene:
-OSHA Permissible Exposure Limit (PEL):
100 ppm (TWA), 200 ppm (Ceiling),
300 ppm/5min/2hr (Max)

-ACGIH Threshold Limit Value (TLV):
50 ppm (TWA) 100 ppm (STEL);
listed as A5, not suspected as a human carcinogen.
Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended*

Practices, most recent edition, for details.

Personal Respirators (NIOSH Approved):

If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. This substance has poor warning properties.

Skin Protection:

Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Neoprene is a recommended material for personal protective equipment.

Eye Protection:

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:

Clear, colorless liquid.

Odor:

Chloroform-like odor.

Solubility:

Practically insoluble in water. Readily miscible in organic solvents.

Specific Gravity:

1.47 @ 20C/4C

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

87C (189F)

Melting Point:

-73C (-99F)

Vapor Density (Air=1):

4.5

Vapor Pressure (mm Hg):

57.8 @ 20C (68F)

Evaporation Rate (BuAc=1):

No information found.

10. Stability and Reactivity

Stability:

Stable under ordinary conditions of use and storage. Will slowly decompose to hydrochloric acid when exposed to light and moisture.

Hazardous Decomposition Products:

May produce carbon monoxide, carbon dioxide, hydrogen chloride and phosgene when heated to decomposition.

Hazardous Polymerization:

Will not occur.

Incompatibilities:

Strong caustics and alkalis, strong oxidizers, chemically active metals, such as barium, lithium, sodium, magnesium, titanium and beryllium, liquid oxygen.

Conditions to Avoid:

Heat, flame, ignition sources, light, moisture, incompatibles

11. Toxicological Information

Toxicological Data:
Trichloroethylene: Oral rat LD50: 5650 mg/kg; investigated as a tumorigen, mutagen, reproductive effector.
Reproductive Toxicity:
This material has been linked to mutagenic effects in humans.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Trichloroethylene (79-01-6)	No	No	2A

12. Ecological Information

Environmental Fate:
When released into the soil, this material may leach into groundwater. When released into the soil, this material is expectedexpected to quickly evaporate. When released to water, this material is expected to quickly evaporate. This material has an experimentally-determined bioconcentration factor (BCF) of less than 100. This material is not expected to significantly bioaccumulate. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life between 1 and 1
Environmental Toxicity:
The LC50/96-hour values for fish are between 10 and 100 mg/l. This material is expected to be slightly toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1710
Packing Group: III
Information reported for product/size: 5GL

International (Water, I.M.O.)

Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1

UN/NA: UN1710
Packing Group: III
Information reported for product/size: 5GL

International (Air, I.C.A.O.)

Proper Shipping Name: TRICHLOROETHYLENE
Hazard Class: 6.1
UN/NA: UN1710
Packing Group: III
Information reported for product/size: 5GL

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Trichloroethylene (79-01-6)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Trichloroethylene (79-01-6)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\---------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Trichloroethylene (79-01-6)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\---------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Trichloroethylene (79-01-6)	100	U228	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Liquid)

WARNING:
THIS PRODUCT CONTAINS A CHEMICAL(S) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

Australian Hazchem Code: No information found.
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **2** Flammability: **1** Reactivity: **0**
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. AFFECTS HEART, CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. CAUSES SEVERE SKIN IRRITATION.

CAUSES IRRITATION TO EYES AND RESPIRATORY TRACT. SUSPECT CANCER HAZARD. MAY CAUSE CANCER. Risk of cancer depends on level and duration of exposure.

Label Precautions:

Do not get in eyes, on skin, or on clothing.
Do not breathe vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat and flame.

Label First Aid:

If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases call a physician. Note to physician: Do not administer adrenaline or epinephrine to a victim of chlorinated solvent poisoning.

Product Use:

Laboratory Reagent.

Revision Information:

MSDS Section(s) changed since last revision of document include: 3, 16.

Disclaimer:

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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

LEAD METAL

MSDS Number: L2347 --- *Effective Date: 12/08/96*

1. Product Identification

Synonyms: Granular lead, pigment metal; C.I. 77575
CAS No.: 7439-92-1
Molecular Weight: 207.19
Chemical Formula: Pb
Product Codes: J.T. Baker: 2256, 2266 Mallinckrodt: 5668

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Lead	7439-92-1	95 - 100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Life)
Flammability Rating: 0 - None
Reactivity Rating: 0 - None

Contact Rating: 1 - Slight
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES
Storage Color Code: Blue (Health)

Potential Health Effects

Inhalation:
Lead can be absorbed through the respiratory system. Local irritation of bronchia and lungs can occur and, in cases of acute exposure, symptoms such as metallic taste, chest and abdominal pain, and increased lead blood levels may follow. See also Ingestion.

Ingestion:
POISON! The symptoms of lead poisoning include abdominal pain and spasms, nausea, vomiting, headache. Acute poisoning can lead to muscle weakness, "lead line" on the gums, metallic taste, definite loss of appetite, insomnia, dizziness, high lead levels in blood and urine with shock, coma and death in extreme cases.

Skin Contact:
Lead and lead compounds may be absorbed through the skin on prolonged exposure; the symptoms of lead poisoning described for ingestion exposure may occur. Contact over short periods may cause local irritation, redness and pain.

Eye Contact:
Absorption can occur through eye tissues but the more common hazards are local irritation or abrasion.

Chronic Exposure:
Lead is a cumulative poison and exposure even to small amounts can raise the body's content to toxic levels. The symptoms of chronic exposure are like those of ingestion poisoning; restlessness, irritability, visual disturbances, hypertension and gray facial color may also be noted.

Aggravation of Pre-existing Conditions:
Persons with pre-existing kidney, nerve or circulatory disorders or with skin or eye problems may be more susceptible to the effects of this substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes. lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not considered to be a fire hazard. Powder/dust is flammable when heated or exposed to flame.

Explosion:
Not considered to be an explosion hazard.

Fire Extinguishing Media:
Use any means suitable for extinguishing surrounding fire. Do not allow water runoff to enter sewers or waterways.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Can produce toxic lead fumes at elevated temperatures and also react with oxidizing materials.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Sweep up and containerize for reclamation or disposal. Vacuuming or wet sweeping may be used to avoid dust dispersal. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances. Areas in which exposure to lead metal or lead compounds may occur should be identified by signs or appropriate means, and access to the area should be limited to authorized persons. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For lead, metal and inorganic dusts and fumes, as Pb: -OSHA Permissible Exposure Limit (PEL): 0.05 mg/m3 (TWA) For lead, elemental and inorganic compounds, as Pb: -ACGIH Threshold Limit Value (TLV): 0.05 mg/m3 (TWA), A3 animal carcinogen ACGIH Biological Exposure Indices (BEI): 30 ug/100ml, notation B (see actual Indices for more information). For lead, inorganic: -NIOSH Recommended Exposure Limit (REL): 0.1 mg/m3 (TWA)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control

the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face high efficiency dust/mist respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficiency dust/mist respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure lethe exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece high efficienc

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

Other Control Measures:
Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored. See OSHA substance-specific standard for more information on personal protective equipment, engineering and work practice controls, medical surveillance, record keeping, and reporting requirements. (29 CFR 1910.1025).

9. Physical and Chemical Properties

Appearance:
Small, white to blue-gray metallic shot or granules.

Odor:
Odorless.

Solubility:
Insoluble in water.

Density:
11.34

pH:
No information found.

% Volatiles by volume @ 21C (70F):
0

Boiling Point:
1740C (3164F)

Melting Point:
327.5C (622F)

Vapor Density (Air=1):
No information found.

Vapor Pressure (mm Hg):
1.77 @ 1000C (1832F)

Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Does not decompose but toxic lead or lead oxide fumes may form at elevated temperatures.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Ammonium nitrate, chlorine trifluoride, hydrogen peroxide, sodium azide, zirconium, disodium acetylide, sodium acetylide and oxidants.

Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Toxicological Data:
Investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
Lead and other smelter emissions are human reproductive hazards. (Chemical Council on Environmental Quality; Chemical Hazards to Human Reproduction, 1981).

Carcinogenicity:
EPA / IRIS classification: Group B2 - Probable human carcinogen, sufficient animal evidence.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Lead (7439-92-1)	No	No	2B

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to leach into groundwater. This material may bioaccumulate to some extent.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Lead (7439-92-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Lead (7439-92-1)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Lead (7439-92-1)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Lead (7439-92-1)	10	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Prop 65:
THIS PRODUCT CONTAINS CHEMICALS KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER AND BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

Australian Hazchem Code: No information found.
Poison Schedule: S6

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products

Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 **Flammability:** 1 **Reactivity:** 0

Label Hazard Warning:
POISON! DANGER! MAY BE FATAL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. NEUROTOXIN. AFFECTS THE GUM TISSUE, CENTRAL NERVOUS SYSTEM, KIDNEYS, BLOOD AND REPRODUCTIVE SYSTEM. POSSIBLE CANCER HAZARD. MAY CAUSE CANCER BASED ON ANIMAL DATA. Risk of cancer depends on duration and level of exposure.

Label Precautions:
Do not get in eyes, on skin, or on clothing. Do not breathe dust. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling.

Label First Aid:
If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

Product Use:
Laboratory Reagent.

Revision Information:
Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:
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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Material Safety Data Sheet

from Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 683

POLYCHLORINATED BIPHENYLS (PCBs)

Issued: November 1988

SECTION 1. MATERIAL IDENTIFICATION

27

Material Name: POLYCHLORINATED BIPHENYLS (PCBs)

Genium

Description (Origin/Uses): Commercial PCBs are mixtures that were once widely manufactured by combining chlorine gas, iron filings, and biphenyls. Their high stability contributes to their intended commercial applications and their accidental, long-term adverse environmental and health effects. PCBs are useful as insulators in electrical equipment because they are electrically nonconductive. Their distribution has been limited since 1976. The Aroclor PCB codes identify PCBs by type. The first two digits of a code indicate whether the PCB contains chlorinated biphenyls (12), chlorinated terphenyls, (54), or both (25, 44); the last two digits indicate the approximate percentage of chlorine. Found in insulating liquid, synthetic rubber, plasticizers, flame retardants, floor tile, printer's ink, paper and fabric coatings, brake linings, paints, automobile body sealants, asphalt, adhesives, electrical capacitors, electrical transformers, vacuum pumps, gas-transmission turbines, heat-transfer fluids, hydraulic fluids, lubricating and cutting oil, copying paper, carbonless copying paper, and fluorescent light ballasts.

Synonym: Chlorodiphenyls

Other Designations (Producer, Trade Name, Nation): Monsanto, Aroclor® (USA, Great Britain); Bayer, Clophen® (German Democratic Republic); Prodelec, Phenoclor®, Pyralene® (France); Kanegafuchi, Kanechlor®; Mitsubishi, Santotherm® (Japan); Caffaro, Fenclor® (Italy).

Trade Name	CAS No.	*RTECS* No.	Trade Name	CAS No.	*RTECS* No.
Aroclors	01336-36-3	TQ1350000	Aroclor 1242	53469-21-9	TQ1356000
Aroclor 1016	12674-11-2	TQ1351000	Aroclor 1248	12672-29-6	TQ1358000
Aroclor 1221	11104-28-2	TQ1352000	Aroclor 1254	11097-69-1	TQ1360000
Aroclor 1232	11141-16-5	TQ1354000	Aroclor 1260	11096-82-5	TQ1362000

HMIS			
H	1	R	1
F	1	I	3
R	0	S	1
PPG*		K	1

SECTION 2. INGREDIENTS AND HAZARDS/EXPOSURE LIMITS

PCB-42% Chlorine/Aroclor 1242
CAS No. 53469-21-9
OSHA PEL (Skin*)
8-Hr TWA: 1 mg/m³
ACGIH TLV (Skin*), 1988-89
TLV-TWA: 1 mg/m³

PCB-54% Chlorine/Aroclor 1254
CAS No. 11097-69-1
OSHA PEL (Skin*)
8-Hr TWA: 0.5 mg/m³
ACGIH TLV (Skin*), 1988-89
TLV-TWA: 0.5 mg/m³

All PCBs/Aroclors
CAS No. 1336-36-3
NIOSH REL 1977
10-Hour TWA: 0.001 mg/m³
Toxicity Data**
Mouse, Oral, LD_{50}: 1900 mg/kg

*This material can be absorbed through intact skin, which contributes to overall exposure.
**See NIOSH, *RTECS* (Genium ref. 90), at the locations specified in section 1 for additional data with references to tumorigenic, reproductive, mutagenic, and irritative effects.

SECTION 3. PHYSICAL DATA

Boiling Point: Ranges from 527°F (275°C) to 725°F (385°C)
Solubility in Water (%): Insoluble
Pour Point: Ranges from -31°F (-35°C) to 87.8°F (31°C)

% Volatile by Volume: Ranges from 1.2 to 1.6
Molecular Weight (Average): Aroclor 1242: 258 Grams/Mole
Aroclor 1254: 326 Grams/Mole

Appearance and Odor: Clear to light yellow mobile oil to a sticky resin; a sweet "aromatic" odor. As the percentage of chlorine increases, the PCB becomes thicker and heavier; e.g., Aroclor 1254 is more viscous than Aroclor 1242.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point*	Autoignition Temperature: Not Found	LEL: Not Found	UEL: Not Found

Extinguishing Media: Use water spray/fog, carbon dioxide (CO_2), dry chemical, or "alcohol" foam to extinguish fires that involve polychlorinated biphenyls. Although it is very difficult to ignite PCBs, they are often mixed with more flammable materials (oils, solvents, etc.) **Unusual Fire or Explosion Hazards:** If a transformer containing PCBs is involved in a fire, its owner may be required to report the incident to appropriate authorities. Consult and follow all pertinent Federal, state, and local regulations. **Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode; fire fighters must also wear a complete set of protective clothing. **Comments:** The hazards of PCB fires are associated with the possibility of their being released into the environment where they and their products of degeneration can pose serious long-term health risks. These potential problems are heightened by the PCBs' resistance to biological and chemical degradation and by the possibility that they will contaminate underground water systems (see sect. 5)

*Ranges from 284°F (140°C) to 392°F (200°C).

SECTION 5. REACTIVITY DATA

Stability/Polymerization: Polychlorinated biphenyls are very stable materials. Hazardous polymerization cannot occur. **Chemical Incompatibilities:** PCBs can react dangerously with sodium or potassium. These reactions are part of an industrial process used to destroy PCBs; however, people have been killed by explosions at PCB treatment, storage, and disposal sites. **Conditions to Avoid:** Limit human exposure to PCBs to the lowest possible level; especially avoid contact with skin. **Hazardous Products of Decomposition:** Thermal-oxidative degradation of PCBs can produce toxic gases such as carbon monoxide, chlorine, chlorinated aromatic fragments, phenolics, aldehydes, and hydrogen chloride. Incomplete combustion of PCBs produces toxic compounds such as polychlorinated dibenzofuran (PCDF, the major product of combustion), and polychlorinated dibenzo-*p*-dioxin (PCDD or dioxin).

SECTION 6. HEALTH HAZARD INFORMATION

Carcinogenicity: The EPA lists PCBs as carcinogens, and the IARC classifies them as probable human carcinogens (group 2B). **Summary of Risks:** Effects of accidental exposure to PCBs include acneform eruptions; eye discharge; swelling of the upper eyelids and hyperemia of the conjunctiva; hyperpigmentation of skin, nails, and mucous membrane; chloroacne; distinctive hair follicles; fever; hearing difficulties; limb spasms; headache; vomiting; and diarrhea. PCBs are potent liver toxins that can be absorbed through unbroken skin in hazardous amounts without immediately discernible pain or discomfort. Severe health effects can develop later. In experimental animals, prolonged or repeated exposure to PCBs by any route results in liver damage at levels that are less than those reported to have caused cancer in rodents. **Medical Conditions Aggravated by Long-Term Exposure:** None reported. **Target Organs:** Skin, eyes, eyelids, blood, liver. **Primary Entry:** Inhalation, skin contact/absorption. **Acute Effects:** Skin and eye irritation, acneform dermatitis, nausea, vomiting, abdominal pain, jaundice, liver damage. *Chronic Effects: Possible cancer (evidence of this is inconclusive); reproductive effects (jaundice,* excessive secretion of tears, dermal chromopexy); and hepatitis. **FIRST AID: Eyes.** Immediately flush eyes, including under the eyelids, gently but thoroughly with flooding amounts of running water for 15 minutes. **Skin.** Rinse exposed skin with flooding amounts of water; wash with soap and water. **Inhalation.** Remove the exposed person to fresh air; restore and/or support breathing as needed. Have qualified medical personnel administer oxygen as required. **Ingestion.** Induce vomiting by sticking your finger to the back of the exposed person's throat. Have him or her drink 1 to 2 glasses of milk or water. Get medical help (in plant, paramedic, community) for all exposures. Seek prompt medical assistance for further treatment, observation, and support after first aid. **Note to Physician:** PCBs are poorly metabolized, soluble in lipids, and they accumulate in tissues or organs rich in lipids. Liver function tests can help to determine the extent of body damage in exposed persons. If electrical equipment containing PCBs arcs over, the PCBs or other hydrocarbon dielectric fluids may decompose and give off hydrochloric acid (HCl), a potent respiratory irritant.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: *Treat any accidental release of PCBs as an emergency. An SPCCP (spill-prevention control and countermeasure plan) must be formulated before spills or leaks occur.* PCBs are resistant to biodegradation, soluble in lipids, and chemically stable; as such they have become significant contaminants of global ecosystems. Releases of PCBs require immediate, competent, professional response from trained personnel. *Each release situation is unique and requires a specifically designed cleanup response.* General recommendations include adhering to Federal regulations (40 CFR Part 761). Notify safety personnel, evacuate nonessential personnel, ventilate the spill area, and contain the PCBs. All wastes, residues, and contaminated cleanup equipment from the incident are subject to EPA requirements (40 CFR 761). Consult your attorney or appropriate regulatory officials for information about reporting requirements and disposal procedures. **Waste Disposal:** Contact your hazardous waste disposal firm or a licensed contractor for detailed recommendations, especially when PCBs are unexpectedly discovered. Follow Federal, state, and local regulations. PCBs are biomagnified in the food chain; i.e., their concentration increases at each link. The disposal of PCBs or of PCB-contaminated materials is strictly regulated; violations of applicable laws can result in fines, lawsuits, and negative publicity. **Warning:** Accidental spills of PCBs that may affect water supplies must be reported to Coast Guard personnel at the National Response Center, telephone (202) 426-2675.

OSHA Designations
Listed as an Air Contaminant (29 CFR 1910.1000 Subpart Z).
EPA Designations (40 CFR 302.4)
CERCLA Hazardous Substance, Reportable Quantity: 10 lbs (4.54 kg), per the Clean Water Act (CWA), §§ 311 (b) (4) and 307 (a).

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing of PCBs is possible, wear a full face shield. Follow OSHA eye- and face-protections regulations (29 CFR 1910.133). **Respirator:** Wear a NIOSH-approved respirator per Genium reference 88 for the maximum-use concentrations and/or exposure limits cited in section 2. Follow OSHA respirator regulations (29 CFR 1910.134). For emergency or nonroutine operations (leaks or cleaning reactor vessels and storage tanks), wear an SCBA. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, and gauntlets, etc., to prevent any contact of PCBs with your skin. **Ventilation:** Install and operate general and local maximum, explosion-proof ventilation systems powerful enough to maintain airborne levels of this material below the OSHA PEL standards cited in section 2. Local exhaust ventilation is preferred because it prevents dispersion of the contamination into the general work area by eliminating it at its source. *Consult the latest edition of Genium reference 103 for detailed recommendations.* **Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do not wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from your shoes and equipment. Heavily soiled clothing must be properly discarded in a manner consistent with applicable regulations. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material and before eating, drinking, smoking, using the toilet, or applying cosmetics. Keep it off your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in work areas.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Store PCBs in closed containers in a cool, dry, well-ventilated area. Protect containers from physical damage. **Special Handling/Storage:** All storage facilities must have adequate containment systems (dikes; elevated, nonporous holding platforms; retaining walls) to prevent any major release of PCBs into the environment. Carefully design and implement these extra precautions now; do not wait until you have to respond to an accidental release of this material.

Transportation Data (49 CFR 172.101-2; PCBs were the first materials to be directly regulated by Congress by way of TSCA in 1976.)

DOT Shipping Name: Polychlorinated Biphenyls
DOT Hazard Class: ORM-E
ID No. UN 2315
DOT Packaging Requirements: 49 CFR 173.510

IMO Shipping Name: Polychlorinated Biphenyls
IMO Hazard Class: 9
IMDG Packaging Group: II

References: 1, 6, 26, 38, 84-94, 100, 101, 116, 117, 120, 122.

Prepared by PJ Igoe, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD

Technical Review: Northeast Analytical, Inc. (PCB and VOC Specialists), Schenectady, New York, Telephone: (518) 346-4592

MOBIL OIL -- AUTOMOTIVE GASOLINE, UNLEADED (MRDUS) - GASOLINE,AUTOMOTIVE
MATERIAL SAFETY DATA SHEET
NSN: 9130001487103
Manufacturer's CAGE: 3U728
Part No. Indicator: B
Part Number/Trade Name: AUTOMOTIVE GASOLINE, UNLEADED (MRDUS)

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General Information

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Item Name: GASOLINE,AUTOMOTIVE
Company's Name: MOBIL OIL CORP
Company's Street: 3225 GALLONS ROAD
Company's City: FAIRFAX
Company's State: VA
Company's Country: US
Company's Zip Code: 22037-0001
Company's Emerg Ph #: 609-737-4411/800-424-9300(CHEMTREC)
Company's Info Ph #: 800-662-4525/800-227-0707 X3265
Distributor/Vendor # 1: MOBIL OIL CORP (609-737-4411)
Distributor/Vendor # 1 Cage: 6A687
Record No. For Safety Entry: 070
Tot Safety Entries This Stk#: 119
Status: FE
Date MSDS Prepared: 03DEC93
Safety Data Review Date: 20OCT94
upply Item Manager: KY
MSDS Preparer's Name: MOBILE OIL CORP
Preparer's Company: ENVIRO HEALTH & SAFETY DEPT.
Preparer's City: PRINCETON
Preparer's State: NJ
MSDS Serial Number: BVGZG
Specification Number: VV-G-1690A
Spec Type, Grade, Class: CL A,B,C,D,E GR REG
Hazard Characteristic Code: F2
Unit Of Issue: GL
Unit Of Issue Container Qty: BULK
Type Of Container: BULK
Net Unit Weight: UNKNOWN

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Ingredients/Identity Information

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Proprietary: NO
Ingredient: GASOLINE
Ingredient Sequence Number: 01
ercent: 100
NIOSH (RTECS) Number: LX3300000
CAS Number: 8006-61-9
OSHA PEL: 300 PPM
ACGIH TLV: 300 PPM/500STEL;9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: METHYL TERT-BUTYL ETHER (SARA III)
Ingredient Sequence Number: 02
Percent: 15
NIOSH (RTECS) Number: KN5250000
CAS Number: 1634-04-4
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: XYLENES (O-,M-,P- ISOMERS) (SARA III)
Ingredient Sequence Number: 03
ercent: 9.9
NIOSH (RTECS) Number: ZE2100000
CAS Number: 1330-20-7
OSHA PEL: 100 PPM

ACGIH TLV: 100 PPM/150STEL;9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: ETHYL ALCOHOL (ETHANOL)
Ingredient Sequence Number: 04
Percent: 10
NIOSH (RTECS) Number: KQ6300000
CAS Number: 64-17-5
OSHA PEL: 1000 PPM
ACGIH TLV: 1000 PPM; 9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: ISOPENTANE
Ingredient Sequence Number: 05
Percent: 9
NIOSH (RTECS) Number: EK4430000
CAS Number: 78-78-4
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: TOLUENE (SARA III)
Ingredient Sequence Number: 06
Percent: 4.65
NIOSH (RTECS) Number: XS5250000
CAS Number: 108-88-3
OSHA PEL: 200 PPM; Z-2
ACGIH TLV: S, 50 PPM; 9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: 1,2,4-TRIMETHYLBENZENE (SARA III)
Ingredient Sequence Number: 07
Percent: 4.55
NIOSH (RTECS) Number: DC3325000
CAS Number: 95-63-6
OSHA PEL: 25 PPM
ACGIH TLV: 25 PPM; 9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: BUTANE
Ingredient Sequence Number: 08
Percent: 4
NIOSH (RTECS) Number: EJ4200000
CAS Number: 106-97-8
OSHA PEL: 800 PPM
ACGIH TLV: 800 PPM; 9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: ISOHEXANE
Ingredient Sequence Number: 09
Percent: 4
NIOSH (RTECS) Number: SA2995000
CAS Number: 107-83-5
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: PENTANE
Ingredient Sequence Number: 10
Percent: 4
NIOSH (RTECS) Number: RZ9450000
CAS Number: 109-66-0

OSHA PEL: 1000 PPM
ACGIH TLV: 600 PPM/750STEL;9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: TRIMETHYL BENZENE (SARA III)
Ingredient Sequence Number: 11
Percent: 3
NIOSH (RTECS) Number: DC3220000
CAS Number: 25551-13-7
OSHA PEL: 25 PPM
ACGIH TLV: 25 PPM; 9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: BENZENE (SARA III)
Ingredient Sequence Number: 12
Percent: 2
NIOSH (RTECS) Number: CY1400000
CAS Number: 71-43-2
OSHA PEL: SEE 1910.1028
ACGIH TLV: 10 PPM; A2; 9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: ETHYL BENZENE (SARA III)
Ingredient Sequence Number: 13
Percent: 2
NIOSH (RTECS) Number: DA0700000
CAS Number: 100-41-4
OSHA PEL: 100 PPM
ACGIH TLV: 100 PPM/125STEL;9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: HEXANE (N-HEXANE)
Ingredient Sequence Number: 14
Percent: 2
NIOSH (RTECS) Number: MN9275000
CAS Number: 110-54-3
OSHA PEL: 500 PPM
ACGIH TLV: 50 PPM; 9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: 3-METHYL PENTANE
Ingredient Sequence Number: 15
Percent: 2
NIOSH (RTECS) Number: SA2995500
CAS Number: 96-14-0
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: 2,3-DIMETHYLBUTANE
Ingredient Sequence Number: 16
Percent: 2
NIOSH (RTECS) Number: EJ9350000
CAS Number: 79-29-8
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: METHYLCYCLOHEXANE
Ingredient Sequence Number: 17
Percent: 1
NIOSH (RTECS) Number: GV6125000

CAS Number: 108-87-2
OSHA PEL: 500 PPM
ACGIH TLV: 400 PPM; 9394
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: 3-METHYLHEXANE
Ingredient Sequence Number: 18
Percent: 2
NIOSH (RTECS) Number: 1011925ME
CAS Number: 589-34-4
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: 2-METHYHEXANE
Ingredient Sequence Number: 19
Percent: 1
NIOSH (RTECS) Number: 1011926MY
CAS Number: 591-76-4
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: METHYLCYCLOPENTANE
Ingredient Sequence Number: 20
Percent: N/GIVEN
NIOSH (RTECS) Number: GY4640000
CAS Number: 96-37-7
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Proprietary: NO
Ingredient: AMYLENE, NORMAL
Ingredient Sequence Number: 21
Percent: N/GIVEN
NIOSH (RTECS) Number: SB2179000
CAS Number: 513-35-9
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED
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Physical/Chemical Characteristics

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Appearance And Odor: CLEAR (MAY BE DYED) LIQUID, GASOLINE ODOR.
Boiling Point: >68F,>20C
Melting Point: N/A
Vapor Pressure (MM Hg/70 F): >400 @20C
Specific Gravity: 0.79
Solubility In Water: NEGLIGIBLE.
Viscosity: 2000MG/KG.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: EYE/RESP IRRIT.PROLONG/REPEAT SKIN CONTACT MAY DEFAT RESULTING IN IRRIT/DERM.CASE REPORT OF CHRONIC ABUSE & MISUSE AS SOLVENT/CLEANING AGENT HAVE REPORTED A RANGE OF NEUROLOGICAL EFFECTS,SUDDEN DEATH FROM CARDIAC ARREST,HEMATOLOGIC CHANGES & LEUKEMIA.THESE ARN'T EXPECTED TO OCCUR @ EXPO LEVELS IN DIST/USE AS MOTOR FUEL
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: YES
Explanation Carcinogenicity: CONTAINS BENZENE.
Signs/Symptoms Of Overexp: DIZZINESS, NAUSEA, LOSS OF CONSCIOUSNESS. DEFATTING, IRRIT, DERMATITIS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MFG.

Emergency/First Aid Proc: EYE:FLUSH WELL W/WATER.IRRIT OCCURS CALL DR. SKIN:WASH W/SOAP & WATER.REMOVE CONTAMIN CLOTHING.INHAL:REMOVE FROM EXPOSURE.RESP IRRIT,DIZZ,NAUSEA,OR UNCONSC OCCURS GET MED ATTN IMMED/CALL DR.STOPPED BREATHING USE MOUTH TO MOUTH RESP.INGEST:NOT EXPECTED TO BE A PROBLEM.IF >1/2L(PT)INGEST IMMED GIVE 1-2 GLASSES OF WATER.CALL DR/HOSP EMERG/POIS CNTRL CNTR.DO NOT INDUCE VOMIT.MAY ASPIRATE INTO LUNGS.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: REPORT SPILLS TO AUTHORITIES.IF ENTER ANY WATERWAY CALL US COAST GUARD 800-424-8802.ELIMINATE ALL IGN SOURCES.RUNOFF FIRE/EXPLO HAZ IN SEWERS.ABSORB ON FIRE RETARDANT TREATED SAWDUST/ DIATOMACEOUS EARTH/ETC.SHOVEL UP & DISPOSE.
Neutralizing Agent: NONE SPECIFIED BY MFG.
Waste Disposal Method: DISPOSE OF @ APPROPRIATE WASTE DISPOSAL FACILITY IAW CURRENT APPLICABLE LAWS & REGS & PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL.PRODUCT SUITABLE FOR BURNING FOR FUEL VALUE IN COMPLIANCE W/ APPLICALBE LAWS/REGS.
Precautions-Handling/Storing: SHOULD NOT BE USED AS SOLVENT OR AS CLENAING AGENT.USE NON-SPARKING TOOLS/EXPLOSION PROOF EQPMT.USE IN WELL VENTILATED ARE AWAY FROM ALL IGN SOURCES.
Other Precautions: AVOID CONTACT W/SKIN & INHAL VAP/MIST.GROUND/BOND DRUMS.EQUIP DRUMS W/SELF-CLOSING VALVES,PRESS VACUUM BUNGS,FLAME ARRESTERS. STORE IN COOL AREA EQUIPPED W/AUTOMATIC SPRINKLING SYS.OUTSIDE/DETACHED STORAGE PREFERRED.GROUND/BOND STORED DRUMS.

Control Measures

Respiratory Protection: APPROVED RESP EQUIPMNET MUST BE USED WHEN AIRBORNE CONCENTRATINS ARE UNKONW OR EXCEED THE TLV.
Ventilation: USE IN WELL VENTI AREA W/LOC EXHAUST VENTI.VENTILATION REQUIRED & EQPMT MUST BE EXPLOSION PROOF.USE AWAY FROM IGN SOURCE
Protective Gloves: IMPERVIOUS GLOVES.
Eye Protection: CHEM TYPE GOGGLES.
Other Protective Equipment: NONE SPECIFIED BY MFG.
Work Hygienic Practices: WASH HANDS AFT HANDLING.FOLLOW GOOD PERSONAL HYGIENE PRACTICES.LAUNDER CONTAMIN CLOTHING PRIOR TO REUSE.

Transportation Data

Trans Data Review Date: 94293
DOT PSN Code: GTN
DOT Proper Shipping Name: GASOLINE
DOT Class: 3
DOT ID Number: UN1203
DOT Pack Group: II
DOT Label: FLAMMABLE LIQUID
IMO PSN Code: HRV
IMO Proper Shipping Name: GASOLINE
IMO Regulations Page Number: 3141
IMO UN Number: 1203
IMO UN Class: 3.1
IMO Subsidiary Risk Label: -
IATA PSN Code: MUC
IATA UN ID Number: 1203
IATA Proper Shipping Name: GASOLINE
IATA UN Class: 3
IATA Label: FLAMMABLE LIQUID
AFI PSN Code: MUC
AFI Prop. Shipping Name: GASOLINE
AFI Class: 3
AFI ID Number: UN1203
AFI Pack Group: II
AFI Basic Pac Ref: 7-7
Additional Trans Data: PER MSDS:DOT/IMO/IATA:SHIPPING NAME GASOLINE, 2, UN1203, PG II,FLAMM LIQ LABEL.

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 20OCT94
Label Status: G
Common Name: AUTOMOTIVE GASOLINE, UNLEADED (MRDUS)
Signal Word: DANGER!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: GASOLINE.FOR USE AS MOTOR FUEL ONLY.EXTREMELY FLAMM.HARMFUL/FATAL IF INGEST.CAUSES CANCER IN LAB ANIMALS.MISUSE OF MATL MAY CASUE SERIOUS INJURY/ILLNESS.1STAID:INGEST:DO NOT INDUCE VOMIT.CALL DR IMMED.INHALED:REMOVE TO FRESH AIR.NOT BREATH GIVE ART RESP PREFERABLY MOUTH-TO-MOUTH.CALL DR.ATTENTION:EMPTY CNTNRS MAY CONTAIN PRODUCT RESIDUE INCLUDING FLAMM/EXPLOSIVE VAP.DO NOT CUT/PUNCTURE/WELD ON/NEAR CNTNR.ALL LABEL WARNINGS/PRECAUTIONS MUST BE OBSERVED TIL CNTNR HAS BEEN CLEANED WELL OR DESTROYED.KEEP AWAY FROM HEAT/SPARKS/FLAME.AVOID PROLONGED BREATH OF VAP.KEEP CNTNR CLOSE.USE ONLY W/ADEQ VENT.NOT TO BE USE AS SOLVENT/CLEANING AGENT.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: MOBIL OIL CORP
Label Street: 3225 GALLONS ROAD
Label City: FAIRFAX
Label State: VA
Label Zip Code: 22037-0001
Label Country: US
Label Emergency Number: 609-737-4411/800-424-9300(CHEMTREC)

MOBIL OIL -- DIESEL FUEL (MRDUS) - DIESEL FUEL
MATERIAL SAFETY DATA SHEET
NSN: 9140002865286
Manufacturer's CAGE: 3U728
Part No. Indicator: B
Part Number/Trade Name: DIESEL FUEL (MRDUS)

General Information

Item Name: DIESEL FUEL
Company's Name: MOBIL OIL CORP
Company's Street: 3225 GALLONS ROAD
Company's City: FAIRFAX
Company's State: VA
Company's Country: US
Company's Zip Code: 22037-0001
Company's Emerg Ph #: 609-737-4411/CHEMTREC 800-424-9300
Company's Info Ph #: 800-662-4525/800-227-0707 X3265
Record No. For Safety Entry: 024
Tot Safety Entries This Stk#: 048
Status: SE
Date MSDS Prepared: 02DEC93
Safety Data Review Date: 19OCT94
Supply Item Manager: KY
MSDS Preparer's Name: ENVIRONMENTAL HEALTH
reparer's Company: MOBIL OIL CORP., PRODUCT FORMULATION
reparer's St Or P. O. Box: 3225 GALLOWS ROAD
Preparer's City: FAIRFAX
Preparer's State: VA
Preparer's Zip Code: 22037
MSDS Serial Number: BVHCG
Specification Number: VV-F-800
Spec Type, Grade, Class: DF-1 GRADE
Hazard Characteristic Code: F4
'Jnit Of Issue: GL
Jnit Of Issue Container Qty: BULK
Type Of Container: TANK
Net Unit Weight: UNKNOWN

Ingredients/Identity Information

Proprietary: NO
Ingredient: NO. 2 DIESEL FUEL
Ingredient Sequence Number: 01
ercent: 100
NIOSH (RTECS) Number: HZ1800000
CAS Number: 68334-30-5
OSHA PEL: NOT ESTABLISHED
ACGIH TLV: NOT ESTABLISHED
Other Recommended Limit: NONE RECOMMENDED

Physical/Chemical Characteristics

Appearance And Odor: CLEAR (MAY BE DYED) LIQUID WITH A HYDROCARBON ODOR.
Boiling Point: >300F,>149C
Melting Point: N/A
Vapor Pressure (MM Hg/70 F): 0.5 @20C
Specific Gravity: 0.82-0.87
Decomposition Temperature: UNKNOWN
Evaporation Rate And Ref: UNKNOWN
Solubility In Water: NEGLIGIBLE
Viscosity: >1.0 @ 40C

Fire and Explosion Hazard Data

Flash Point: >125F,>52C
Flash Point Method: PMCC
Lower Explosive Limit: 0.6

Upper Explosive Limit: 7.0
Extinguishing Media: CARBON DIOXIDE, FOAM, DRY CHEMICAL AND WATER FOG.
Special Fire Fighting Proc: USE WATER TO KEEP FIRE EXPOSED CONTAINERS COOL. WATER SPRAY MAY BE USED TO FLUSH SPILLS AWAY FROM EXPOSURES. PREVENT RUNOFF FROM FROM ENTERING WATER SUPPLY.
Unusual Fire And Expl Hazrds: MATERIAL IS COMBUSTIBLE.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): HEAT, SPARKS, FLAME AND BUILD-UP OF STATIC ELECTRICITY.
Materials To Avoid: HAOLGENS, STRONG ACIDS, ALKALIES AND OXIDIZERS.
Hazardous Decomp Products: CARBON MONOXIDE
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: ORAL LD50 (RAT) >2,000 MG/KG
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: EYES: IRRITATION. SKIN: PROLONGED, REPEATED SKIN CONTACT MAY RESULT IN SKIN IRRITATION OR MORE SERIOUS SKIN DISORDERS. INHALATION: DIZZINESS, NAUSEA OR UNCONSCIOUSNESS. INGESTION: IF MATERIAL IS ASPIRATED INTO THE LUNGS, MAY CAUSE CHEMICAL PNEUMONITIS.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: POSSIBLE CARCINOGENIC HAZARD MAY EXIST.
Signs/Symptoms Of Overexp: THIS PRODUCT CONTAINS POLYCYCLIC AROMATIC HYDROCARBONS, SOME OF WHICH HAVE BEEN REPORTED TO CAUSE SKIN CANCER IN HUMANS UNDER CONDITIONS OF POOR PERSONAL HYGIENE, PROLONGED REPEATED CONTACT AND EXPOSURE TO SUNLIGHT. PROLONGED SKIN CONTACT ON LABORATORIES ANIMALS HAS CAUSE TOXIC EFFECTS SUCH AS SKIN CANCER, LIVER DAMAGE
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYE CONTACT: FLUSH THOROUGHLY WITH WATER. IF IRRITATION OCCURS, CALL A PHYSICIAN. SKIN: DRY-WIPE THE SKIN. CLEANSE THE AREA WITH WATERLESS HAND CLEANER, FOLLOW BY WASHING WITH SOAP AND WATER. INHALATION: REMOVE FROM FURTHER EXPOSURE. IF RESPIRATORY PROBLEMS OCCUR, SEEK IMMEDIATE MEDICAL ASSISTANCE. INGESTION: DO NOT INDUCE VOMITING. GIVE 1 TO 2 GLASSES OF WATER. GET MEDICAL ASSISTANCE.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: ADSORB ON FIRE RETARDANT TREATED SAWDUST, DIATOMACEOUS EARTH, ETC. SHOVEL UP AND DISPOSE OF AT AN APPROPRIATE WASTE DISPOSAL FACILITY IN ACCORDANCE WITH CURRENT APPLICIABLE LAWS AND REGULATIONS, AND PRODUCT CHARACTERISTICS AT TIME OF DISPOSAL.
Neutralizing Agent: NOT APPLICABLE
Waste Disposal Method: PRODUCT IS SUITABLE FOR BURNING FOR FUEL VALUE IN COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.
Precautions-Handling/Storing: HARMFUL IN CONTACT WITH OR IF ABSORBED THROUGH THE SKIN. AVOID INHALATION OF VAPORS OR MISTS. STORE IN A COOL AREA. GROUND AND BOND TRANSFER EQUIPMENT
Other Precautions: A FLAMMABLE ATMOSPHERE CAN BE PRODUCED IN STORAGE TANK HEADSPACES EVEN WHEN STORED AT A TEMPERATURE BELOW THE FLASHPOINT. ENSURE THAT THERE ARE NO IGNITION SOURCES IN THE AREA IMMEDIATELY SURROUNDING FILLING AND VENTING OPERATIONS.

Control Measures

Respiratory Protection: NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIOND OF USE AND WITH ADEQUATE VENTILATION.
Ventilation: USE IN WELL VENTILATED AREA. VENTILATION DESIRABLE AND EQUIPMENT SHOULD BE EXPLOSION PROOF.
Protective Gloves: IMPERVIOUS GLOVES
Eye Protection: USE CHEMICAL SAFETY GOGGLES

Other Protective Equipment: EYE WASH STATION & SAFETY SHOWER. IF CONTACT IS LIKELY OIL IMPERVIOUS CLOTHING MUST BE WORN.
Work Hygienic Practices: GOOD PERSONAL HYGIENE MUST BE PRACTICED.
Suppl. Safety & Health Data: WASH OR TAKE SHOWER IF GENERAL CONTACT OCCURS. REMOVE OIL-SOAKED CLOTHING AND LAUNDER BEFORE REUSE. DISCARD CONTAMINATED LEATHER GLOVES AND SHOES.

Transportation Data

Trans Data Review Date: 94292
DOT PSN Code: EXF
DOT Symbol: D
DOT Proper Shipping Name: DIESEL FUEL
DOT Class: 3
DOT ID Number: NA1993
DOT Pack Group: III
DOT Label: NONE
IMO PSN Code: HRR
IMO Proper Shipping Name: GAS OIL
IMO Regulations Page Number: 3375
IMO UN Number: 1202
IMO UN Class: 3.3
IMO Subsidiary Risk Label: -
IATA PSN Code: MTX
IATA UN ID Number: 1202
IATA Proper Shipping Name: GAS OIL
ATA UN Class: 3
ATA Label: FLAMMABLE LIQUID
AFI PSN Code: MTX
AFI Prop. Shipping Name: GAS OIL OR DIESEL FUEL OR HEATING OIL, LIGHT
AFI Class: 3
AFI ID Number: UN1202
AFI Pack Group: III
AFI Basic Pac Ref: 7-7

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 19OCT94
MFR Label Number: NONE
Label Status: F
Common Name: DIESEL FUEL (MRDUS)
ignal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Slight: X
Fire Hazard-Moderate: X
Reactivity Hazard-None: X
Special Hazard Precautions: EYES: IRRITATION. SKIN: PROLONGED, REPEATED SKIN CONTACT MAY RESULT IN SKIN IRRITATION OR MORE SERIOUS SKIN DISORDERS. INHALATION: DIZZINESS, NAUSEA OR UNCONSCIOUSNESS. INGESTION: IF MATERIAL IS ASPIRATED INTO THE LUNGS, MAY CAUSE CHEMICAL PNEUMONITIS. HARMFUL IN CONTACT WITH OR IF ABSORBED THROUGH THE SKIN. AVOID INHALATION OF VAPORS OR MISTS. STORE IN A COOL AREA. GROUND AND BOND TRANSFER EQUIPMENT. TARGET ORGANS: SKIN, RESPIRATORY TRACT.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: MOBIL OIL CORP
Label Street: 3225 GALLONS ROAD
Label City: FAIRFAX
Label State: VA
Label Zip Code: 22037-0001
abel Country: US
Label Emergency Number: 609-737-4411/CHEMTREC 800-424-9300

MSDS Material Safety Data Sheet

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

HYDROCHLORIC ACID, 33 - 40%

MSDS Number: H3880 --- *Effective Date: 12/08/96*

1. Product Identification

Synonyms: Muriatic acid; hydrogen chloride, aqueous
CAS No.: 7647-01-0
Molecular Weight: 36.46
Chemical Formula: HCl
Product Codes:
J.T. Baker: 5367, 5537, 5575, 5800, 5814, 5839, 6900, 7831, 9529, 9530, 9534, 9535, 9536, 9537, 9538, 9539, 9540, 9544, 9548
Mallinckrodt: 2062, 2612, 2624, 2626, 5587, H611, H613, H615, V078

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Hydrogen Chloride	7647-01-0	33 - 40%	Yes
Water	7732-18-5	60 - 67%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 2 - Moderate
Contact Rating: 3 - Severe (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER

GLOVES
Storage Color Code: White (Corrosive)

Potential Health Effects

Inhalation:
Corrosive! Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death.
Ingestion:
Corrosive! Swallowing hydrochloric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract. May cause nausea, vomiting, and diarrhea. Swallowing may be fatal.
Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and discolor skin.
Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth. Long term exposures seldom occur due to the corrosive properties of the acid.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye disease may be more susceptible to the effects of this substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Extreme heat or contact with metals can release flammable hydrogen gas.
Explosion:
Not considered to be an explosion hazard.
Fire Extinguishing Media:
If involved in a fire, use water spray. Neutralize with soda ash or slaked lime.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Structural firefighter's protective clothing is ineffective for fires involving hydrochloric acid. Stay away from ends of tanks. Cool tanks with water spray until well after fire is out.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker NEUTRASORB(tm) or TEAM(tm) 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. When opening metal containers, use non-sparking tools because of the possibility of hydrogen gas being present. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listedamage. Keep out of

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL):
5 ppm Ceiling
-ACGIH Threshold Limit Value (TLV):
5 ppm Ceiling

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.
Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a full facepiece respirator with an acid gas cartridge may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure to prevent skin contact.
Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless, fuming liquid.
Odor:
Pungent odor of hydrogen chloride.
Solubility:
Infinite in water with slight evolution of heat.
Density:
1.18
pH:
For HCL solutions: 0.1 (1.0 N), 1.1 (0.1 N), 2.02 (0.01 N)
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
53C (127F) Azeotrope (20.2%) boils at 109C (228F)
Melting Point:
-74C (-101F)
Vapor Density (Air=1):
No information found.
Vapor Pressure (mm Hg):
190 @ 25C (77F)
Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.
Hazardous Decomposition Products:
When heated to decomposition, emits toxic hydrogen chloride fumes and will react with water or steam to produce heat and toxic and corrosive fumes. Thermal oxidative decomposition produces toxic chlorine fumes and explosive hydrogen gas.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
A strong mineral acid, concentrated hydrochloric acid is incompatible with many substances and highly reactive with strong bases, metals, metal oxides, hydroxides, amines, carbonates and other alkaline materials. Incompatible with materials such as cyanides, sulfides, sulfites, and formaldehyde.
Conditions to Avoid:
Heat, direct sunlight.

11. Toxicological Information

Inhalation rat LC50: 3124 ppm/1H; oral rabbit LD50: 900 mg/kg (Hydrochloric acid concentrated); investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Hydrogen Chloride (7647-01-0)	No	No	3
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is not expected to biodegrade. When released into the soil, this material may leach into groundwater.
Environmental Toxicity:
This material is expected to be toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

International (Water, I.M.O.)

Proper Shipping Name: HYDROCHLORIC ACID
Hazard Class: 8
UN/NA: UN1789
Packing Group: II
Information reported for product/size: 475LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia

Ingredient				
Hydrogen Chloride (7647-01-0)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

\Chemical Inventory Status - Part 2\

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Hydrogen Chloride (7647-01-0)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

\Federal, State & International Regulations - Part 1\

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Hydrogen Chloride (7647-01-0)	5000	500*	Yes	No
Water (7732-18-5)	No	No	No	No

\Federal, State & International Regulations - Part 2\

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Hydrogen Chloride (7647-01-0)	5000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: Yes
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2R
Poison Schedule: No information found.
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: **3** Flammability: **0** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG DAMAGE.
Label Precautions:
Do not get in eyes, on skin, or on clothing.
Do not breathe vapor or mist.
Use only with adequate ventilation.
Wash thoroughly after handling.
Store in a tightly closed container.
Remove and wash contaminated clothing promptly.
Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.

Revision Information:
New 16 section MSDS format, all sections have been revised.
Disclaimer:
****

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****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

NITRIC ACID, 50-70%

MSDS Number: N3660 --- *Effective Date: 12/08/96*

1. Product Identification

Synonyms: Aqua Fortis; Azotic Acid; Nitric Acid 50%; Nitric Acid 65%; nitric acid 69-70%
CAS No.: 7697-37-2
Molecular Weight: 63.00
Chemical Formula: HNO3
Product Codes: J.T. Baker: 5371, 5555, 5876, 9597, 9598, 9600, 9601, 9602, 9604, 9606, 9607, 9616 Mallinckrodt: 1409, 2703, 2704, 6623, V069, V077, V336, V561

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Nitric Acid	7697-37-2	65 - 70%	Yes
Water	7732-18-5	30 - 35%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 0 - None
Reactivity Rating: 3 - Severe (Oxidizer)

Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
Storage Color Code: Yellow (Reactive)

Potential Health Effects

Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison.

Inhalation:
Corrosive! Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract.

Ingestion:
Corrosive! Swallowing nitric acid can cause immediate pain and burns of the mouth, throat, esophagus and gastrointestinal tract.

Skin Contact:
Corrosive! Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color.

Eye Contact:
Corrosive! Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Chronic Exposure:
Long-term exposure to concentrated vapors may cause erosion of teeth and lung damage. Long-term exposures seldom occur due to the corrosive properties of the acid.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders, eye disease, or cardiopulmonary diseases may be more susceptible to the effects of this substance.

4. First Aid Measures

Immediate first aid treatment reduces the health effects of this substance.
Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
DO NOT INDUCE VOMITING! Give large quantities of water or milk if available. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Eye Contact:

Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. Can react with metals to release flammable hydrogen gas.

Explosion:
Reacts explosively with combustible organic or readily oxidizable materials such as: alcohols, turpentine, charcoal, organic refuse, metal powder, hydrogen sulfide, etc. Reacts with most metals to release hydrogen gas which can form explosive mixtures with air.

Fire Extinguishing Media:
Water spray may be used to keep fire exposed containers cool. Do not get water inside container.

Special Information:
Increases the flammability of combustible, organic and readily oxidizable materials. In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Neutralize with alkaline material (soda ash, lime), then absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. J. T. Baker NEUTRASORB(tm) or TEAM(tm) 'Low Na+' acid neutralizers are recommended for spills of this product.

7. Handling and Storage

Store in a cool, dry, ventilated storage area with acid resistant floors and good drainage. Protect from physical damage. Keep out of direct sunlight and away from heat, water, and incompatible materials. Do not wash out container and use it for other purposes. When diluting, the acid should always be added slowly to water and in small amounts. Never use hot water and never add water to the acid. Water added to acid can cause uncontrolled boiling and splashing. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL): 2 ppm (TWA), 4 ppm (STEL) -ACGIH Threshold Limit Value (TLV): 2 ppm (TWA); 4 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Nitric acid is an oxidizer and should not come in contact with cartridges and canisters that contain oxidizable materials, such as activated charcoal. Canister-type respirators using sorbents are ineffective.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Colorless to yellowish liquid.

Odor:
Suffocating, acrid.

Solubility:
Infinitely soluble.

Specific Gravity:
1.41

pH:
1.0 (0.1M solution)

% Volatiles by volume @ 21C (70F):
100 (as water and acid)

Boiling Point:
122C (252F)

Melting Point:
-42C (-44F)

Vapor Density (Air=1):
2-3

Vapor Pressure (mm Hg):
48 @ 20C (68F)

Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Containers may burst when heated.

Hazardous Decomposition Products:
When heated to decomposition, emits toxic nitrogen oxides fumes and hydrogen nitrate. Will react with water or steam to produce heat and toxic and corrosive fumes.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
A dangerously powerful oxidizing agent, concentrated nitric acid is incompatible with most substances, especially strong bases, metallic powders, carbides, hydrogen sulfide, turpentine, and combustible organics.

Conditions to Avoid:
Light and heat.

11. Toxicological Information

Nitric acid: Inhalation rat LC50: 244 ppm (NO2)/30M; Investigated as a mutagen, reproductive effector. Oral (human) LDLo: 430 mg/kg.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Nitric Acid (7697-37-2)	No	No	None
Water (7732-18-5)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.

Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Although not a listed RCRA hazardous waste, this material may exhibit one or more characteristics of a hazardous waste and require appropriate analysis to determine specific disposal requirements. Processing, use or contamination of this product may change the

waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 150LB

International (Water, I.M.O.)

Proper Shipping Name: NITRIC ACID (WITH NOT MORE THAN 70% NITRIC ACID)
Hazard Class: 8
UN/NA: UN2031
Packing Group: II
Information reported for product/size: 150LB

International (Air, I.C.A.O.)

Proper Shipping Name: NITRIC ACID
Hazard Class: 8
UN/NA: UN2031
Packing Group: I
Information reported for product/size: 150LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Nitric Acid (7697-37-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Nitric Acid (7697-37-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------------

	-SARA 302-		------SARA 313------	
Ingredient	RQ	TPQ	List	Chemical Catg.
Nitric Acid (7697-37-2)	1000	1000	Yes	No
Water (7732-18-5)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\----------------

		-RCRA-	-TSCA-
Ingredient	CERCLA	261.33	8(d)

Nitric Acid (7697-37-2)	1000	No	No
Water (7732-18-5)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 2PE
Poison Schedule: S6

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 3 **Flammability:** 0 **Reactivity:** 0 **Other:** Oxidizer

Label Hazard Warning:
POISON! DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE. CORROSIVE. LIQUID AND MIST CAUSE SEVERE BURNS TO ALL BODY TISSUE. MAY BE FATAL IF SWALLOWED OR INHALED. INHALATION MAY CAUSE LUNG AND TOOTH DAMAGE.

Label Precautions:
Do not get in eyes, on skin, or on clothing. Do not breathe vapor or mist. Use only with adequate ventilation. Wash thoroughly after handling. Keep from contact with clothing and other combustible materials. Do not store near combustible materials. Wash thoroughly after handling. Keep from contact with clothing and other combustible

Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In all cases get medical attention immediately.

Product Use:
Laboratory Reagent.

Revision Information:
Mixture. New 16 section MSDS format, all sections have been revised.

Disclaimer:
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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

SCIENTIFIC GAS PRODUCTS -- HYDROGEN
MATERIAL SAFETY DATA SHEET
NSN: 683000N044251
Manufacturer's CAGE: 54262
Part No. Indicator: A
Part Number/Trade Name: HYDROGEN

==========

General Information

==========

Company's Name: SCIENTIFIC GAS PRODUCTS INC
Company's Street: 2330 HAMILTON BLVD
Company's P. O. Box: 648
Company's City: SOUTH PLAINFIELD
Company's State: NJ
Company's Country: US
Company's Zip Code: 07080
Company's Emerg Ph #: 201-754-7700
Company's Info Ph #: 201-754-7700
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 12APR93
Safety Data Review Date: 18OCT95
MSDS Serial Number: BTLSD
Hazard Characteristic Code: G2

==========

Ingredients/Identity Information

==========

Proprietary: NO
Ingredient: HYDROGEN
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: MW8900000
CAS Number: 1333-74-0
OSHA PEL: N/K (FP N)
ACGIH TLV: SIMPLE ASPHYXIANT

Proprietary: NO
Ingredient: SUPP DATA:SYS MUST BE CHECKED FOR LEAKS USING AN AQ SOAP SOLN. ALL SYS EQUIP & LINES MUST BE ELECTRICALLY (ING 3)
Ingredient Sequence Number: 02
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 2:GROUNDED, ESP GLASSWARE & PLASTIC TUBING WHICH ARE PRONE TO STATIC ELECTRICITY BUILD-UP. DOWNSTREAM EQUIP (ING 4)
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 3:MUST BE DESIGNED TO HANDLE MAXIMUM PRESS TO WHICH IT WILL BE EXPOSED. USE EXPLOS-PROOF MOTORS, TOOLS, (ING 5)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 4:LIGHTS & FIXTURES IN WORK AREA. TRANSPORT ALL COMPRESSED GAS CYL W/AN APPROP CYL CART OR TRUCK. USE A (ING 6)
Ingredient Sequence Number: 05
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 5:FLAMMABLE GAS MONITOR AT ALL TIMES WHEN WORKING W/ HYDROGEN.
Ingredient Sequence Number: 06
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS, ODORLESS GAS.
Boiling Point: -423F,-253C
Vapor Pressure (MM Hg/70 F): N/A
Vapor Density (Air=1): 0.069
Specific Gravity: N/A
Evaporation Rate And Ref: NOT APPLICABLE
Solubility In Water: 0.019 CC/CC WATER
Percent Volatiles By Volume: 100

Fire and Explosion Hazard Data

Flash Point: FLAMMABLE GAS
Lower Explosive Limit: 4%
Upper Explosive Limit: 74.2%
Extinguishing Media: CARBON DIOXIDE, DRY CHEMICAL OR HALON
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPRVD SCBA & FULL PROT EQUIP (FP N). IF POSS, ELIM SOURCE OF GAS. OTHERWISE, ALLOW FIRE TO BURN UNDER CONTROL UNTIL GAS SUPPLY IS (SUP DAT)
Unusual Fire And Expl Hazrds: IF FLAMES ARE EXTINGUISHED PRIOR TO ELIMINATING GAS SUPPLY, EXPLOS REIGNITION MAY OCCUR. HYDROGEN BURNS W/NO EVIDENT FLAME. DO NOT ENTER DANGER AREA (SUP DAT)

Reactivity Data

Stability: YES
Cond To Avoid (Stability): SPARKS, OPEN FLAMES & EXCESSIVE TEMPERATURES.
Materials To Avoid: OXIDIZERS.
Hazardous Decomp Products: NONE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: NO
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: TLV: SIMPLE ASPHYXIANT. CAUSES ASPHYXIATION IF ALLOWED TO DISPLACE THE OXYGEN CONTENT IN THE ATMOSPHERE NECESSARY TO SUSTAIN LIFE.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT.
Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: INHAL:IF DIZZINESS OCCURS, REMOVE TO FRESH AIR IMMEDIATELY. INGEST:CALL MD IMMEDIATELY (FP N). EYES:IMMEDIATELY FLUSH W/POTABLE WATER FOR A MINIMUM OF 15 MINS. SEEK ASSISTANCE FROM MD (FP N). SKIN:FLUSH W/COPIOUS AMOUNTS OF WATER. CALL MD (FP N).

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUATE AREA. REMOVE ALL POTENTIAL SOURCES OF IGNITION. VENTILATE AREA, ESPECIALLY HIGH PLACES WHERE HYDROGEN WILL RISE & ACCUMULATE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: CONTACT SUPPLIER FOR DISPOSAL INSTRUCTIONS. DISPOSAL MUST BE IN ACCORDANCE W/FEDERAL, STATE & LOCAL REGULATIONS (FP N).

Precautions-Handling/Storing: HYDROGEN MUST BE STORED AWAY FROM OXIDIZING AGENTS, E.G. OXYGEN, CHLORINE & FLUORINE. CYL STORED OUTDOORS MUST BE PROTECTED FROM EXTREMES OF WEATHER.
Other Precautions: HYDROGEN IS EXTREMELY FLAMM & MUST BE STORED IN A COOL, DRY, WELL-VENTD AREA & MUST BE PROTECTED FROM OPEN FLAMES, SPARKS & OTHER POTNTL SOURCES OF IGNIT. THAW ACCUMULATED ICE OR SNOW ON CYL AT ROOM TEMPS. NEVER USE A TORCH OR (SUP DAT)

Control Measures

Respiratory Protection: NIOSH/MSHA APPROVED OXYGEN-DEFFICIENT ATMOSPHERES ARE FLAMMABLE. DO NOT ENTER AREA.
Ventilation: MECHANICAL VENTILATION MUST COMPLY W/NEC FOR CLASS 1, GROUP B.
Protective Gloves: FOR HANDLING CYLINDERS TYPE GLOVES.
Eye Protection: SAFETY GLASSES,GOGGLES AND/OR FACESHLD.
Other Protective Equipment: NONE SPECIFIED BY MANUFACTURER.
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: FIRE FIGHT PROC:DEPLETED. COOL CONTR W/WATER SPRAY BUT DO NOT EXTING THE FLAMES. EXPLO HAZ:UNTIL GAS HAS DISSIPATED. FORMS EXPLOS MIX W/AIR, OXYGEN & ALL OXIDIZING AGENTS. OTHER PREC:OTHER SOURCE OF INTENSE HEAT TO THAW ICE ON A CYL. "NO SMOKING" SIGNS MUST BE POSTED IN ALL WORK & STOR AREAS. THE HYDROGEN GAS (ING 2)

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 04OCT93
Label Status: G
Common Name: HYDROGEN
Chronic Hazard: NO
Signal Word: DANGER!
Acute Health Hazard-Slight: X
Contact Hazard-None: X
Fire Hazard-Severe: X
Reactivity Hazard-None: X
Special Hazard Precautions: FLAMMABLE GAS. ACUTE: SIMPLE ASPHYXIANT. CHRONIC: NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: SCIENTIFIC GAS PRODUCTS INC
Label Street: 2330 HAMILTON BLVD
Label P.O. Box: 648
Label City: SOUTH PLAINFIELD
Label State: NJ
Label Zip Code: 07080
Label Country: US
Label Emergency Number: 201-754-7700

BENTONITE -- P1 CATALYST
MATERIAL SAFETY DATA SHEET
NSN: 561000N083248
Manufacturer's CAGE: BENTX
Part No. Indicator: A
Part Number/Trade Name: P1 CATALYST

General Information

Company's Name: BENTONITE CORP
Company's Street: 1999 BROADWAY, SUITE 4300
Company's City: DENVER
Company's State: CO
Company's Country: US
Company's Zip Code: 80202
Company's Emerg Ph #: 303-291-2940
Company's Info Ph #: 303-291-2940; 303-291-2950
Safety Data Action Code: A
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 29FEB92
Safety Data Review Date: 19FEB98
MSDS Serial Number: CGPYD

Ingredients/Identity Information

Proprietary: NO
Ingredient: PROPYLENE CARBONATE; (METHYLENE-1, 3-DIOXIAN-2-ONE (100%))
Ingredient Sequence Number: 01
Ingredient Action Code: A
NIOSH (RTECS) Number: 1003092PC
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Physical/Chemical Characteristics

Appearance And Odor: COLORLESS LIQUID; SLIGHT ODOR.
Boiling Point: 468F,242C
Vapor Pressure (MM Hg/70 F): 0.03
Vapor Density (Air=1): N/A
Specific Gravity: 1.20 (H*2O=1)
Solubility In Water: SOLUBLE
Percent Volatiles By Volume: NONE
pH: 7.0

Fire and Explosion Hazard Data

Flash Point: 275F,135C
Flash Point Method: PMCC
Extinguishing Media: ACCORDING TO THE NFPA GUIDE, USE WATER SPRAY, DRY CHEMICAL, FOAM OR CARBON DIOXIDE. WATER OR FOAM MAY CAUSE (SUPDAT)
Special Fire Fighting Proc: USE NIOSH APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N). KEEP CONTAINERS COOL WITH WATER SPRAY.
Unusual Fire And Expl Hazrds: MAY GIVE OFF TOXIC VAPORS WHEN BURNED.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE DOCUMENTED.
Materials To Avoid: NONE SPECIFIED BY MANUFACTURER.
Hazardous Decomp Products: BURNING MAY RELEASE CARBON DIOXIDE, CARBON MONOXIDE, OXIDES OF NITROGEN, CHLORINE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
MAY CAUSE IRRITATION OR REDNESS. SKIN CONTACT: EFFECTS OF DERMAL CONTACT SLIGHT, IF ANY. INHALATION: MAY CAUSE IRRITATION TO NOSE, THROAT AND LUNGS. INGESTION: ANEMIA IN DOGS AND ADVERSE CHANGES, SOME SERIOUS, TO THE LUNGS, LIVER, GI AND REPRODUCTIVE (EFTS OF OVEREXP)
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: HLTH HAZ: ORGANS OF RATS AND MICE HAVE BEEN OBSERVED IN LABORATORY ANIMALS AFTER PROLONGED INGESTION OF 2.0 GRAMS PER KILOGRAM OF BODY WEIGHT PER DAY OF PROPYLENE CARBONATE
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: INGEST: CALL MD IMMEDIATELY (FP N). EYES: FLUSH WITH WATER FOR AT LEAST 15 MINUTES. HOLD BACK EYELIDS DURING FLUSHING. GET MEDICAL ATTENTION. SKIN: FLUSH AREAS OF CONTACT WITH WATER. INHAL: IF OVERCOME BY DUST, REMOVE TO FRESH AIR. IF BREATHING IS DIFFICULT, GIVE OXYGEN. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. GET MEDICAL ATTENTION.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: SWEEP UP MATERIAL USING NORMAL HOUSEKEEPING PROCEDURES AND HOLD FOR DISPOSAL. MATERIAL IS SLIPPERY WHEN WET.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISPOSE OF IN ACCORDANCE WITH ALL FEDERAL, STATE AND LOCAL REGULATIONS.
Precautions-Handling/Storing: WEAR APPROPRIATE PROTECTIVE EQUIPMENT WHEN HANDLING. CLOSE CONTAINER WHEN NOT IN USE. AVOID PROLONGED INHALATION.
Other Precautions: DO NOT REUSE EMPTY CONTAINER. MISUSE OF EMPTY CONTAINERS CAN BE HAZARDOUS. EMPTY CONTAINERS CAN BE HAZARDOUS; CAN BE HAZARDOUS IF USED TO STORE TOXIC, FLAMMABLE OR REACTIVE MATERIALS. CUTTING OR WELDING OF EMPTY CONTAINERS MIGHT (SUPDAT)

Control Measures

Respiratory Protection: NONE NECESSARY WHEN HANDLED AT AMBIENT TEMPERATURES. USE NIOSH APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).
Ventilation: USE WITH ADEQUATE VENTILATION.
Protective Gloves: BUTYL RUBBER GLOVES.
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGLES (FP N).
Other Protective Equipment: ANSI APPROVED EYE WASH & DELUGE SHOWER (FP N). APRON, COVERALLS.
Work Hygienic Practices: DO NOT WEAR CONTACT LENSES. AVOID CONTACT WITH EYES. WASH THOROUGHLY AFTER HANDLING.
Suppl. Safety & Health Data: EXTING MEDIA: FROTHING. USE WATER TO COOL FIRE EXPOSED CNTNRS. IF A LEAK/SPILL HAS NOT IGNITED, USE WATER SPRAY TO DISPERSE VAPORS & TO PROVIDE PROTECTION FOR PERSONS ATTEMPTING TO STOP THE LEAK. OTHER PRECS: CAUSE FIRE, EXPLOSION OR TOXIC FUMES FROM RESIDUES. DO NOT PRESSURIZE OR EXPOSE TO OPEN FLAME OR HEAT.

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 19FEB98
Label Date: 13FEB98
Label Status: M
Common Name: P1 CATALYST
Chronic Hazard: NO

Signal Word: CAUTION!
Acute Health Hazard-Slight: X
Contact Hazard-Slight: X
Fire Hazard-Slight: X
Reactivity Hazard-None: X
Special Hazard Precautions: COMBUSTIBLE. ACUTE: EYE CONTACT: MAY CAUSE IRRITATION OR REDNESS. SKIN CONTACT: SLIGHT EFFECTS. INHALATION: MAY CAUSE IRRITATION TO NOSE, THROAT AND LUNGS. CHRONIC: NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: BENTONITE CORP
Label Street: 1999 BROADWAY, SUITE 4300
Label City: DENVER
Label State: CO
Label Zip Code: 80202
Label Country: US
Label Emergency Number: 303-291-2940

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ALCONOX(tm)

MSDS Number: A2052 --- *Effective Date: 12/08/96*

1. Product Identification

Synonyms: Alkyl Aryl Sulfonates
CAS No.: Not applicable.
Molecular Weight: Not applicable.
Chemical Formula: Not applicable.
Product Codes: A461

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Alconox(tm)	N/A	90 - 100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! CAUSES IRRITATION.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 1 - Slight
Flammability Rating: 0 - None
Reactivity Rating: 1 - Slight
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Orange (General Storage)

Potential Health Effects

Inhalation:
None identified.

Ingestion:
May be harmful.

Skin Contact:
Irritation.

Eye Contact:
Irritation.

Chronic Exposure:
No information found.

Aggravation of Pre-existing Conditions:
No information found.

4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Prompt action is essential.

Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes.

Eye Contact:
In case of eye contact, immediately flush with plenty of water for at least 15 minutes.

5. Fire Fighting Measures

Fire:
Not expected to be a fire hazard.

Explosion:
None identified.

Fire Extinguishing Media:
Use extinguishing media appropriate for surrounding fire.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode.

6. Accidental Release Measures

Wear self-contained breathing apparatus and full protective clothing. With clean shovel, carefully place material into clean, dry container and cover; remove from area. Flush spill area with water.

7. Handling and Storage

Keep container tightly closed. Suitable for any general chemical storage area. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
None established.

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

Personal Respirators (NIOSH Approved):
For conditions of use where exposure to the substance is apparent, consult an industrial hygienist. For emergencies, or instances where the exposure levels are not known, use a full-facepiece positive-pressure, air-supplied respirator. WARNING: Air purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
White Powder.

Odor:
No information found.

Solubility:
Appreciable (>10%)

Specific Gravity:
0.00

pH:
No information found.

% Volatiles by volume @ 21C (70F):
N/A

Boiling Point:
No information found.

Melting Point:
No information found.

Vapor Density (Air=1):
Not applicable.

Vapor Pressure (mm Hg):
Not applicable.

Evaporation Rate (BuAc=1):
No information found.

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
No information found.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
No information found.

Conditions to Avoid:
No information found.

11. Toxicological Information

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Alconox(tm)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.

Environmental Toxicity:

No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be managed in an appropriate and approved waste disposal facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Not regulated.

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Alconox(tm)	Yes	No	No	No

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Alconox(tm)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313------ List	Chemical Catg.
Alconox(tm)	No	No	No	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Alconox(tm)	No	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: No Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: No information found.
Poison Schedule: No information found.

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

Label Hazard Warning:
WARNING! CAUSES IRRITATION.

Label Precautions:
Keep in tightly closed container. Wash thoroughly after handling.

Label First Aid:
In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse.

Product Use:
Laboratory Reagent. Research and Development Use Only.

Revision Information:
Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:
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Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

CARLSON ENVIRONMENTAL, INC.'s

RESPIRATOR PROTECTION PROGRAM

Prepared for:
The Employees of Carlson Environmental Inc.
312 West Randolph Street
Suite 300
Chicago, Illinois 60606

January 1997

Purpose

The purpose of this operating procedure is to ensure the protection of all employees from respiratory hazards, through proper use of respirators. Respirators are to be used only where engineering control of respirator hazards is not feasible, while engineering controls are being installed or in emergencies.

Responsibility

The company Safety Officer is Edward Garske. He is solely responsible for all facets of this program and has full authority to make necessary decisions to ensure success of this program. This authority includes hiring personnel and making equipment purchases necessary to implement and operate the program. The Safety Officer will develop written detailed instructions covering each of the basics elements in this program, and is the sole person authorized to amend these instructions.

Carlson Environmental, Inc. has expressly authorized the Safety Officer to halt any operation of the company where there is danger of serious personal injury. This policy includes respiratory hazards.

It is also the responsibility of the worker/supervisor to follow the instructions noted in the Respirator Protection Program.

Program Elements

1.) The Safety Officer will develop detailed written standard operating procedures governing the selection and use of respirators, using the NIOSH Respirator Decision Logic as a guideline. Outside consultation, manufacturer's assistance and information from other recognized authorities will be consulted if there is any doubt regarding proper selection and use. These detailed procedures will be included as appendices to this respirator program. Only the Safety Officer may amend these procedures.

2.) Respirators will be selected on the basis of hazards to which the worker is exposed. All selections will be made by the Safety Officer. Only NIOSH-certified respirators will be selected and used.

3.) The user will be instructed and trained in the proper use of respirators and their limitations. Both supervisors and workers will be so instructed by the Safety Officer. Training should provide the employee an opportunity to handle the respirator, have it fitted properly, test its facepiece-to-face seal, wear it in normal air for a long period and finally to wear it in a test

atmosphere. Every respirator wearer will receive fitting instructions, including demonstrations and practice in how the respirator should be worn, how to adjust it and how to determine if it fits properly.

Respirators should not be worn when conditions prevent a good face seal. Such conditions may be a growth of beard, sideburns, a skull cap that protects under the facepiece or temple pieces on glasses. No employees of Carlson Environmental, Inc. who are required to wear respirators may wear beards. Also, the absence of one or more dentures can seriously affect the fir of one's facepiece. The worker's diligence in observing these factors will be evaluated be periodic checks. To assure proper protection, the facepiece fit will be checked by the wearer each time the wearer puts on the respirator by performing a positive and negative fit test. Carlson Environmental, Inc. will perform qualitative fit testing on each employee that will be wearing a respirator biannually. This will be done by following the manufacturer's facepiece-fitting instructions.

4.) Where practicable, the respirators will be assigned to individual workers for their exclusive use.

5.) Respirators will be regularly cleaned and disinfected. Those issued for the exclusive use of one worker will be cleaned after each day's use, or more often if necessary. Those used by more than one worker will be thoroughly cleaned and disinfected after each use. This will be done by following the manufacturer's facepiece-cleaning instructions.

6.) The central respiratory cleaning and maintenance facility will store respirators in a clean and sanitary location.

7.) Respirators used routinely will be inspected during cleaning. Worn or deteriorated parts will be replaced. Respirators for emergency use, such as self-contained devices, will be thoroughly inspected at least once a month and after each use. Inspection for SCBA breathing gas pressure will be performed daily when the SCBAs are in use.

8.) Appropriate surveillance of work area conditions and degree of employee exposure or stress will be maintained.

9.) There will be regular inspection and evaluation to determine the continued effectiveness of the program. The Safety Officer will make frequent inspections of all areas where respirators are used to ensure compliance with the respirator protection programs.

10.) Persons will not be assigned to tasks requiring use of respirators unless it has been determined that they are physically able to perform the work and use of the equipment. The Carlson Environmental, Inc. Physician will determine what health and physical conditions are pertinent. The respirator user's medical status will be reviewed annually.

11.) Only certified respirators will be used.

Attachments

Attachment A - Copies of Individual Qualitative Fit Test Certifications and Medical Clearance

Attachment B - Copy of the NIOSH Guide to the Selection and Use of Particulate Respirators Certified Under 42 CFR 84

Attachment C- A Copy of OSHA 29 CFR 1910.134 Title: Respiratory Protection, Subpart I, Subpart Title: Personal Protective Equipment

Attachment D - Manufacturers Guidelines for MSA Respirators

Carlson Environmental, Inc. notes that it is the responsibility of the employee to use this Respirator Protection Plan in conjunction with Carlson Environmental, Inc.'s Corporate Healthy and Safety Plan and any Site-Specific Health and Safety Plan.

Sincerely,

CARLSON ENVIRONMENTAL, INC.

Richard J. Carlson
President

Edward E. Garske
Vice President